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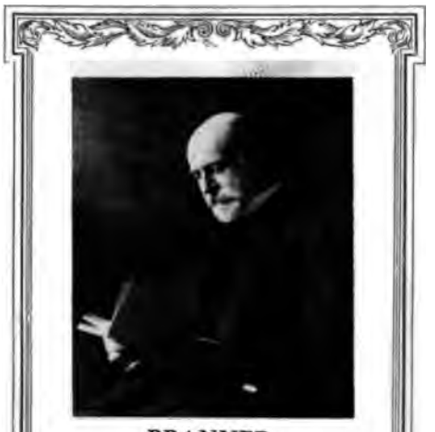

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TASMANIA.

REPORT

OF THE

ECRETARY FOR MINES

FOR

1896-7,

NCLUDING THE REPORTS OF THE COMMISSIONERS OF MINES, THE INSPECTORS OF MINES, THE GOVERNMENT GEOLOGIST, THE MOUNT CAMERON WATER-RACE BOARD, &c.

Tasmania:
WILLIAM GRAHAME, JUN., GOVERNMENT PRINTER, HOBART.

1897.

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(No. 44.)

REPORT OF THE SECRETARY FOR MINES.

Mines Department, Hobart, 31st July, 1897.

SIR,

I HAVE the honour to submit my Report of the Mines Department for the year ending 30th June, 1897.

Appendices.

Appended will be found Reports from the various Commissioners of the condition of the Mining Industry in the Divisions under their charge; the Reports of the Inspectors of Mines; the Annual Report of the Government Geologist; the Annual Report of the Mount Cameron Water-race Board; and the Government Geologist's Reports—

(1.) On the Lefroy Gold Field.
(2.) On the Scamander Mining District.
(3.) On the Mineral-bearing Country between Corinna and Waratah.
(4.) On the Shepherd and Murphy's Tin Mine, Bell Mount;

with Returns of the operations of the Diamond Drills, together with Tables showing the yield of Gold, Tin, and Coal; the number of persons engaged in Mining; the number of Leases and Area of Land held under Lease for Mining purposes; the number of Mining Companies registered during the year; and the net Revenue paid into the Treasury from Mines.

General remarks.

The hopeful opinion which was expressed of the mining industry in last year's Report has been fully borne out by the results of the past twelve months' work. Unfortunately a revival in mining is always attended with the flotation of numerous companies for purely speculative purposes, which does much to discourage the investment of capital in legitimate mining ventures, but on the whole a more healthy tone now prevails, and a great deal of real prospecting and development work has been done during the year, with encouraging results. The most notable feature of the year's progress has been the marked success which has attended the skilful treatment of the Mt. Lyell ores, and this has caused increased attention to be paid to other large bodies of low grade ore which are known to exist in various parts.

Although there has been a slight falling-off in value in gold and tin this has been more than made up by the increased output from the West Coast District, and, for the first time in the history of the Colony, copper forms an important item in the mineral exports. The total value of metals and minerals raised during the year has exceeded £760,000, out of which dividends to the amount of £166,447 have been paid, exclusive of the first dividend of the Mt. Lyell Mining and Railway Co., amounting to £44,220, which was payable on July 1st, 1897.

Mount Lyell.

Energetic work is going on at several of the mines in the immediate vicinity of Mt. Lyell.

North-east Dundas Tramway.

The narrow gauge railway from Zeehan to the N. E. Dundas District has been completed to a distance of 13½ miles. It is contemplated to extend this line to the Rosebery Field. The construction of this light railway has been amply justified, and it is likely to prove of great value to the District.

Waratah-Zeehan Railway.

The construction of this line has not yet been begun, but it is anticipated that an early start will be made. This will lead to increased prospecting, as the route runs through very promising mineral-bearing country.

Great Western Railway.

During last session of Parliament a Bill was passed giving a company powers to construct a railway from Glenora to Mt. Lyell, but active operations have not yet been started.

Zeehan. This field is fully maintaining its reputation, and one very satisfactory feature is that preparations are being made at several of the mines for deep sinking. This is a most important step, and the ultimate permanence of the field largely depends on the results obtained.

Dundas. Although only two mines in this field are at present exporting ore, active exploratory and development work is going on at several others with encouraging indications.

North-East Dundas District At Mount Read steady work is still going on, and some very rich ore has been obtained. Connection with the N.E. Dundas Tramway will, probably, soon be made. In the neighbourhood of Ringville, several of the Curtin-Davis group of mines have ore stacked ready for shipment as soon as connection is made with the tramway. In the Rosebery District active development work is being carried on, and the Tasmania Copper Company are making preparations for the erection of extensive reduction works.

Corinna to Waratah. A little prospecting is still going on in the neighbourhood of Corinna. At the Rocky River considerable activity prevails, and work has lately been resumed on a large deposit of low grade ore on the Savage River. Attention is being again directed to the Heazlewood and Whtye River fields, and a little ore is being raised. Between the Whyte River and Mount Bischoff, the Magnet Silver Mine promises, with energetic development, to become a large producer of silver-lead ore.

Mount Bischoff. The output of the Mount Bischoff Mine is still maintained. Up to June 30 this Company had distributed £1,465,000 among its shareholders, and still continues to pay regular monthly dividends. Very little tin has been raised in this district during the year outside the parent mine. Work has lately been resumed at the old Silver Cliff Silver Mine.

North-West Coast. A trial shipment of iron ore from the River Blyth has lately been made, and it is hoped that this may lead to the regular working of the extensive deposits known to exist there. A little coal is still being raised from the Mersey and Dulverton Mines. In the vicinity of Middlesex and Bell Mount prospecting is still being carried on, and a little bismuth ore has been sent away.

Beaconsfield. The Tasmania Mine is still the principal gold-producer in the Colony, and the yield shows no sign of falling off. During the year, £36,242 have been distributed in dividends, bringing the total amount paid to shareholders up to £652,517.

There is a probability of some of the outside mines being thoroughly tested by the introduction of English capital.

Attention is again being directed to the utilization of the asbestos which is known to exist in considerable quantities in the vicinity of Beaconsfield.

Lefroy. Very little gold has been raised from this field during the year. Two of the companies, with commendable energy, have sunk to a depth of over 1100 ft., and although payable stone has not yet been found, there is sufficient improvement to warrant the expenditure of further capital in proving the reefs of this field at a greater depth, and Mr. Montgomery's Report should act as a further incentive in this direction.

North-Eastern District. Considerable prospecting and development work has been done on the various gold mines in this district, with fairly satisfactory results. The output of alluvial tin ore has been rather less than usual, owing to scarcity of water and the low price of tin; but extensive deposits are still known to exist, and a slight rise in the price of the metal and more abundant supplies of water would lead to much greater activity, with largely increased output.

Eastern District. Scarcity of water has also affected the output of alluvial tin ore in this district. It is satisfactory to note that extensive plants are being erected to work the tin lodes of the Blue Tier on a large scale.

Scamander. Very little progress has been made on this field during the year.

Mathinna. The New Golden Gate mine is still looking well and paying regular dividends. In seven and a half years this company has paid £148,800 in dividends. A good deal of English capital has been invested on this field, and a large amount of work done, with but little success up to the present.

Mangana. Active prospecting work is also going on at Mangana, but so far no important discoveries have been made.

Mount Nicholas Coalfield. There has been a considerable increase in the output of coal from the Cornwall and Mount Nicholas Coal Mines during the past twelve months; and another discovery of good coal has recently been made about three miles from St. Mary's Railway Station. Unfortunately these mines are situated too far from the seaboard to enable them to export at a profit, and the demand is therefore limited.

The foregoing matters are here mentioned to show that the mining industry is progressing. Fuller details are given in the attached Reports of the various Commissioners.

Prospecting. Active prospecting has been carried on in various parts of the Colony throughout the year, but there are still large tracts of promising country which are practically inaccessible, and it is highly probable that many valuable discoveries will be made as the country is gradually opened up by tracks and rail or tramways.

Mine Managers' Examination. No candidates for examination for Mine Managers' Certificates have presented themselves during the year, but one First-class Service Certificate has been issued. The warning given last year may here be repeated, that probably at no distant period every person in charge of a mine will require to be the holder of a certificate of competency, and more attention should be paid to these examinations by intending mine managers and those who are at present uncertificated.

Mining Laws. Experience has proved that certain modifications of our mining laws are advisable, and steps are being taken to remedy any defects during the present Session of Parliament.

Schools of Mines. The School of Mines which was established at Zeehan a few years ago is still making steady progress, and its sphere of usefulness will continually increase, as apparatus, mineral collections, &c., are gradually acquired as funds will allow. In 1896 a grant of £100 was made by Parliament, and in 1897 this was increased to £200. Competent instructors have been secured, and classes are held in Mathematics, Elementary Applied Mechanics, Mechanical Drawing, Mine Surveying, Chemistry, Chemical Analysis, Assaying, Mineralogy, Blow-piping, Ore-dressing, Engine-driving, and Management. Arrangements have also been made for holding annual examinations under Government supervision. This institution is likely to prove of great service to the colony, and is deserving of every encouragement.

Mineral Production. The yield of gold for the year has been 56,875 ozs., as against 63,861 ozs. for the previous year, a decrease in value of £23,341. This decrease is due to the falling off in the Lefroy yields, which this year amounted to 1785 ozs. as against 10,160 ozs. for the previous year. Beaconsfield produced 35,934 ozs., and Mathinna 16,117 ozs., as against 33,686 ozs. and 15,663 ozs. respectively for the year ending June 30, 1896.

Silver. The output of silver ore for the year was 21,123 tons, valued approximately at £232,350. The figures for the previous year were 21,360 tons, valued at £213,600, so that though there has been a decrease of 237 tons, the average value per ton has considerably increased.

Tin. There has been considerable falling off in the output of tin ore for the last two quarters, but the returns for the whole year show an increase of 309 tons on last year's figures.

Coal. The output of Coal has increased by 10,400 tons.

Copper. 1928 tons of Blister Copper, valued at £128,032, have been sent away.

Division of the Colony. The Colony, for departmental convenience, is divided into Districts as follows:—The Northern and Southern, comprising the country on the right and left banks of the River Tamar as far west as the River Forth, and on the east to the Scottsdale District, with such mineral country as there is in the southern portion of the Colony, and includes the gold-fields of Beaconsfield, Lefroy, and Lisle. The North-Eastern District comprises the whole of the north-eastern country, including several important tin-fields, with the gold-fields of Waterhouse, Warrentinna, and Mount Victoria. The Eastern District comprises the eastern portion of the Colony, and includes the tin-fields of Weldborough, Blue Tier, Gould's Country, Ben Lomond, and St Paul's River, the extensive coal-bearing country around Fingal and Seymour, with the gold-fields at Mathinna and Mangana. The Western and North-Western District embraces the wide area of country extending from the River Forth northwards and southwards to the sea; it includes the celebrated tin deposits at Mt. Bischoff, the River Iris, an extensive area of tin-bearing couuntry at Heemskirk and Cox's Bight, the silver-fields at Heazlewood, Zeehan, and Dundas, the gold-fields at Mount Read, Mount Lyell, and the Linda, with other more or less important centres.

Departmental Staff. During the year the Department, and I may say the mining community of the Colony, have sustained a very servere loss in the removal, to a more lucrative post in New Zealand, of the Geological Surveyor, Mr. A. Montgomery, M.A. This officer was most capable; he was gradually acquiring a good knowledge of the geology of this Colony; he spared no pains to do justice in his descriptions of the various parts of the country he was called upon to visit and report upon; his services and his wide knowledge of the country were of great value to the mining industry; he had the fullest confidence of the Government and the Department. His successor, Mr. J. Harcourt-Smith, a graduate of Cambridge University, was selected, in March last by a Board appointed for the purpose, out of ten first-class applicants. He has had several years' experience at Frieberg, Clausthel, and elsewhere, and holds a good record for his work in this Colony. So far,

his reports give evidence of ability. The only other changes have been the appointment of two junior clerks in the Launceston and Strahan offices respectively.

It affords me great pleasure to record my thanks to the various officers of the Department for the loyal, able, and willing assistance afforded through the year.

The Report of the Board which has control of this Race is annexed.

Details of the work done with these machines are appended.

In conclusion, I have much pleasure in reporting that the progress made during the year points to the continued and increasing prosperity of the Mining Industry.

I have the honour to be,
Sir,
Your obedient Servant,

F. BELSTEAD, *Secretary for Mines.*

The Honourable the Minister of Mines.

REPORTS OF COMMISSIONERS.

Mr. Commissioner GLOVER writes:—

IN my last annual Report on the Mining Industry of the Northern Division, I had occasion to record the fact that the three dividend-paying mines at Lefroy had reached the limits of the surface productiveness, which have hitherto restricted profitable work on the reefs at Lefroy, namely, a depth of about 400 feet; and that the proprietors had adopted the wise resolve to test the mines to whatever depth might ultimately be necessary to restore them to a productive and more permanent condition. I have now the satisfaction to report that this salutary object is still being persistently carried out by two of these mines, namely, the "New Pinafore" and "Volunteer," which, up to the present, have reached to the depths of 1150 feet and 1140 feet respectively. And, although the object sought has not yet been attained, sufficient improvement of the lodes is manifest to justify and encourage the continuance of the work of deep sinking. Moreover, as this is an operation in which long periods of expensive "dead work" must necessarily be undergone, rendering the question of pecuniary means an all-important factor, it is a most fortunate circumstance that the New Pinafore proprietors are able to avail themselves of the gold contained in the vast accumulation of sand and pyrites—the battery "tailings" of the past 18 years—by extracting the gold by the cyanide process, the necessary apparatus having been duly provided. The Volunteer proprietors are also erecting similar appliances for a like purpose. There is, therefore, every reason to expect that the question of greatest importance to the mining prospects of Lefroy will, at length, be definitely settled. The other mining operations on this field, with the exception of the "Golden Point and Crown," are little better than ineffective and useless prospecting operations, by means of local capital and penny "calls," which are totally inadequate for any effectual development at Lefroy; though it is said that some four of these are about to be amalgamated for more effective work.

On the Beaconsfield Goldfield, some eight or nine months ago, much local excitement was caused by the discovery of rich alluvial deposits of coarse gold at Eaglehawk Gully, Salisbury. The locality proved to be a very narrow gully, affording room for very few persons, but much ground was marked off in the neighbourhood for leases and prospecting claims overlapping each other in every direction, and giving rise to the usual disputes and litigation. This "rush" has now been worked out as regards alluvial gold, but it has resulted in some 400 ounces being added to the Beaconsfield yield for the year, and prospecting is still proceeding in search of the lodes from which the gold had been derived.

Perhaps the most important event, in its bearing upon the effectual development of these goldfields, is the immediate prospect of the importation of English capital for the working of the claims adjoining the Tasmania mine on the south east, arrangements having been entered into by which a working capital of £40,000 is to be provided at once. The return of the documents, duly executed, which were sent to England with the transfers of leases, &c. for the purpose, is daily expected, when the English company will commence work at once. Seeing that ample English capital is the only effective means for the development of these goldfields, the importance of this

project being carried out cannot be too highly estimated. The question of the recovery of the gold hitherto lost in the sand and pyrites of battery "tailings" is now receiving practical attention at Beaconsfield, as well as at Lefroy. The Tasmania Company's chlorine works are now in full operation, the yield being about 2 ozs. to the ton, at a cost of a little over nineteen shillings an ounce; and an association has recently purchased from the Company the accumulated tailings from the upper (or Florence) battery—some 20,000 tons—and having erected the necessary appliances, are now treating the material by the cyanide process. In the neighbourhood of Beaconsfield a new direction of enterprise has recently taken place, the object of which is to utilise the asbestos which has been known to exist there for many years. The promoters of this project a short time ago obtained a prospecting area of 400 acres, but were very shortly sufficiently satisfied with the results to induce them to alter their tenure for the more permanent one of leases. The principals in this project are at present in New Zealand, but it is expected that operations of some consequence will shortly become apparent. For the past year the yield of Beaconsfield was 35,934 ounces of gold, value £132,738.

Golconda, Denison, &c. still continue to engross the attention of prospectors, some 30 persons being at present occupied there, principally engaged by associations. Ever since the discovery some 16 years ago of a quantity of rich specimens in Panama creek, the locality has from time to time become the scene of prospecting labours in the hope of finding the lode from which the specimens were derived, but without success until five months ago, when the discovery was made of a reef about two feet wide showing gold at the surface of many ounces to the ton, but decreasing as depth was attained, and prospectors are now busily engaged in exploring the neighbourhood. There are several highly promising claims at Golconda which are at present the subject of negotiations for the aid of English capital, such being the only mode of development upon which reliance can be placed.

The old alluvial goldfield of Lisle has nothing to present worth recording, though it still continues to keep about 40 men, who are principally attached to small farms, and who supplement their income by gold-digging on the old workings.

Middlesex and Bell Mount present nothing worthy of notice, being principally occupied by prospectors, as to the result of whose labours nothing has transpired.

Mr. Commissioner O'Reilly reports:— North-Eastern Division.

Gold.—During the past year at Mount Victoria gold-mining operations have been principally confined to preparatory work in opening out the mines by driving, &c., and considerable progress has been made in that direction. A good deal of prospecting work has also been done, with satisfactory results. On the whole, the prospects of this field are considered very encouraging, and such as to warrant expenditure of capital in its development, confidence being expressed in its future advancement. About 40 miners are now employed in this locality.

But slow progress has been made at Warrentinna since my last report. There are several known reefs on a few of the principal claims, which give promise of richness to pay handsome returns if a sufficient amount of capital were expended in sinking on them to a proper depth. It appears to me that the prospects of the place fully warrant such expenditure. All the past yields of gold from this field have been won from shallow workings, and were considered of a payable character. The Derby Gold Mining Company are driving a considerable distance to cut the reef on their claim at a low level and I trust that this company's enterprise will be fully rewarded.

It is to be regretted that at Waterhouse nothing in the way of mining has been done during the year. The known reefs in this locality have never been properly prospected to a sufficient depth, owing to the large quantity of water that flows into low-level sinkings there. The expenditure required to supply a powerful pumping plant prevents persons with a small amount of capital from undertaking mining operations at this place, but the locality appears to me worthy of the attention of those who could afford an expenditure in the direction I have indicated.

In the Mount Cameron District, the Portland Gold Mining Company are sinking on a reef which, although small, gives promise of much richness, and is considered in its present state payable. It is expected that the further working of this mine will lead to a larger body of lode being found to exist of similar character.

On the whole, I consider the prospects of the gold mining industry in this district fairly satisfactory. I have no doubt that during the coming year a considerable advancement in its condition will be observable.

Tin.—The past year has proved a very trying one to claimholders, not only through the low price of tin ruling in the market, but also through the almost unprecedented dry season since the new year, and consequent shortness in the supply of water for the mines. Up to the present time, since January last, the reservoirs or dam sites in the Mount Cameron District have remained quite

dry, a state of things not before experienced, consequently the claims dependent upon such sources of water supply have remained unworked; but, as it may be reasonably expected that the winter rains will now soon set in, an improved condition in the state of mining in that locality will begin.

In the Upper Ringarooma locality there are but few miners at work, principally about Mount Maurice and the Cascades Range, under Miners' Rights. On the old established claims at Branxholm, Derby, Moorina, and Pioneer active mining operations are continued, and on the whole the yields are considered satisfactory. A good deal of preparatory work has been done also in the way of removing the large deposit of surface matter that overlies the deposit of tin. The want of a full supply of water for hydraulic sluicing is much complained of, and it will be necessary that further efforts and enterprise should be exhibited to obtain an adequate supply by tapping new sources.

So long as the price of tin ore keeps at a low figure, I cannot look forward for any material improvement in the state of mining in this district. With a moderate advance in price a revival or return of prosperity would set in with largely increased numbers engaged in carrying on mining operations, as these are extensive areas of tin deposit of moderate richness which, at current rates for tin, would barely pay wages to mine, but with an advance in prices of ore would ensure profitable returns. It is satisfactory to observe that the tin market has an upward tendency, which it is to be hoped may continue.

Notwithstanding the drawbacks to mining in this district before referred to, it is gratifying to find that, on the whole, the yield of tin ore for the past twelve months has been satisfactory, the quantity raised being 1052 tons. The average number of men employed at mining—Europeans, 193; Chinese, 244.

Eastern Division.

Mr. Commissioner DAWSON reports:—

Alluvial Tin.

The yield of tin ore from the alluvial has been less than usual, but this may be accounted for by the want of water. It has been one of the driest years we have had for the last 19 years, thereby precluding men working under their Miners' Rights from even making half wages during the year. The same reason also applies to holders of Mineral Sections, who in great measure, like the holders of Miners' Rights, have to depend on storm waters. Now that the long drought has broken up, miners are again at work with a good supply of water. I therefore venture to think that the next quarter's returns will show an increased yield.

Lode Tin-mining.

On my last visit to the Anchor Tin Mine I was informed by the Manager, Mr. W. H. Wesley, that they will not make a start crushing until they have their 200 head of stamps ready for work, which I fancy will not be much before the end of the year. I was very much struck with the magnitude of the work now going on at the Anchor Mine. All the machinery appears to be of the very best description, and quite up to date with all the latest improvements. The erection of this splendid mass of machinery certainly reflects the greatest credit upon all concerned.

Mr. Deedes, the Chairman of Directors of the Anchor Company, has purchased a claim called the Liberator, situated not far from the Anchor, the Manager of which is preparing to erect a 20 head battery similar in every way to the Anchor plant. The Australian Mine (late Puzzle) is now in course of re-construction under the new management, the whole of the machinery erected by the late management not being considered satisfactory.

When the three companies that I have referred to make a start, it will certainly prove whether the large masses of low grade tin stuff that abounds on their several claims will pay by being treated by improved machinery.

Gold.

Mathinna.

I have lately visited Mathinna, and have nothing very special to report as to this industry. The Golden Gate Company is still paying uniform dividends, and the mine is still looking well. The company are now erecting plant to treat the large quantity of tailings that have for years been accumulating at the mine.

The English Prospecting Association has done a large amount of work in deep sinking both north and south of the Golden Gate, but up to date has not met with any marked success. Prospecting is still actively going on in the vicinity of Mathinna by various prospectors.

Mangana.

On my last visit to Mangana, on 14th June, I found work going on actively at the New Sovereign mine which is being thoroughly prospected under Mr. J. Goodall as Manager. Other claims are being prospected, but up to date nothing has been discovered to call for any special remark.

Gold obtained from the alluvial is practically a thing of the past.

Silver.

At the Scamander prospecting is still going on but only on a limited scale. Mr. Harcourt Smith's report supplies more reliable information than I can give as to the Scamander silver sections.

The Mount Nicholas and Cornwall mines are now and have been for several months fully employed. The output of coal shows a marked increase. The coal, too, keeps up its quality, as the extra demand for it proves. Coal.

Another discovery of good coal has been made about three miles from the St. Mary's Railway Station, and is now being prospected by the proprietary. The several tests made with this coal have proved very satisfactory.

Without being over-sanguine, I am of opinion that should we get the usual winter rains mining matters in this district will show a marked improvement during the next quarter.

Mr. Commissioner HALL reports:— Western Division, Northern portion.

During the past year mining has made steady and important advances in prosperity.

The older mines, such as the Western, Silver Queen, Oonah, Montana, and Comet, have regularly kept up their usual monthly output; but where there is most food for congratulation is in the new mines that are opening up in the vicinity of Zeehan and in the Dundas District, particularly in the latter. Silver-lead.

The total amount of silver-lead ore sent from the Zeehan Railway Station during the year is 20,994 tons, value, approximately, £227,000, to which each of the following mines have contributed £15,000 or over:—Western, 4092 tons, value £56,000; Silver Queen, 5207 tons, value £50,560; Montana, 2582 tons, value £42,530; Oonah, 2050 tons, value £29,800; and Comet, 2417 tons, value £15,000. The balance of the amount exported has been produced in varying quantities by the following mines:—Silver King, Mount Zeehan (Tasmania), Silver Queen Extended, New Mount Zeehan, Tasmanian Crown, Junction, M'Kimmie, Empress, Smith's Section, Montagu, West Comet, Comstock, Bell, South-West Curtin-Davis, Western Extended, New Tasmania, and Kozminsky. Zeehan.

The greatest depth yet reached on the field is at the Western Mine, where the main shaft is down 515 feet. To that depth the lode shows strong well-defined walls, with no appearance of falling off in width, but whether or not it is ore-bearing is not yet shown. This mine, to facilitate its operations, is obtaining one of the most modern and approved air-compressor plants for driving rock-drills.

At the Montana new pumping and winding plant is being erected to enable sinking to a depth of 1000 feet. The plant will be completed in about three months, and it is the company's intention to ascertain as speedily as possible the value of their lodes at that distance below surface. This company and the Oonah are each erecting concentrators, and expect to have them in running order in about three or four months.

After being idle for a considerable time the Empress (formerly the Grubb's S. M. Co.), Oceana, and the Mariposa, have resumed work. The Oceana have erected a compact and substantial pumping and winding plant, which was built at Salisbury's Foundry, Launceston. The main workings, and also those of the Mariposa, are connected by tramway with the Strahan-Zeehan railway at Argenton.

The Comet and M'Kimmie mines are at present the only ore-exporting mines of this part of the District. The concentrators from the New Tasmania Mine at Comstock have been removed and re-erected by the Comet Company near the Maestries' Railway Station for its own use. The M'Kimmie Company has recently erected a pumping and winding plant. Dundas.

There are many sections in the vicinity of Dundas on which vigorous work is being done, and which have every indication of ultimately becoming valuable mines.

The Mt. Reid Mine employs at present only two or three men, work having temporarily almost ceased. During the year a good deal of work was done in exposing the large lode formation, and proving it for some distance down. A large amount of work has been done at the Hercules, and some very rich ore was lately obtained, assaying, in silver contents, over 3000 ozs. to the ton. Altogether about 100 men are now employed on the different Mt. Reid mines. Mount Read

The Rosebery District employs about 80 men. The Tasmania Copper Company's mine is being rapidly developed, and is expected to become one of the most valuable in the District. It has about 1500 tons of ore stacked, and men are engaged clearing sites for reducing works, tramways, &c, Rosebery.

The mines of the Curtin-Davis group are showing a great deal of activity, and over 150 men are employed hereabouts. The Curtin-Davis Proprietary Co. have a large quantity of ore stacked on the mine, and are sending 1000 tons to Europe for experimental purposes to test its value Ringville.

and the best methods of treatment. This will be the first ore carried from Ringville over the N. E. Dundas tramway. The South-West Curtin-Davis Company have nearly completed an aerial tram, in two sections of a total length of 20 chains, to connect the mine workings with the North-East Dundas Tramway.

This Company has sent away a parcel of about 20 tons of ore, and has about 50 tons on hand to be exported as soon as the aerial tram is completed.

In this district several new and most promising lodes have lately been discovered, and are now being explored. There is every indication that the district will be very prosperous and valuable, and as the various mines are developed will add largely to the West Coast mineral output.

The rails on the North-East Dundas Tramway are now laid for a distance of about 13½ miles from Zeehan, and have passed the township of Ringville.

Altogether the outlook for the whole district is most encouraging. The mines I have mentioned as having exported ore during the past year will more than keep up the output in the coming year, and there are others that are nearing that stage of development that will enable them soon to become exporters. There are many which are now only in an early stage of development, but which will, when sufficiently advanced, add very largely to the mineral wealth produced in the district.

Gold. Small quantities of gold (totalling 180 oz.) have been obtained from the Ring River and vicinity. Most of the surface ground has been worked out, and there does not seem much probability of any increase in the returns for next year.

Tin. Tin has practically ceased to be a product of the district. The present low price does not allow of sufficient profit to induce search for it.

Coal. A seam of brown coal discovered over four years ago, three or four miles south of Argenton, has been receiving attention lately, and efforts are being made to form a small company to work it. It is said to be a good clean household coal, burning freely, and throwing out a good heat.

Western Division, Southern portion.

Mr. Commissioner Fowell writes:—

I have the honour to submit my Report on the progress of the Mining Industry in the Southern portion of the Western Mining District for the year ending 30th June, 1897.

The Mount Lyell Company's Mine of necessity takes premier position. During the past year the system of treatment of the ore has been completed so far as to render it a marketable commodity, in the form of "Blister Copper."

Three furnaces are now in full working order, and two more will soon be completed. So much has appeared in the public print during the past twelve months about this mine and the treatment of the ore that it seems needless for me to enter into particulars, and I will confine myself to assuring you that what is written about it is not exaggerated, and that by thoroughly skilful treatment and judicious management, this mine has, and moreover, doubtless will, continue to realize all that was anticipated from it. As regards the outside mines (as they are termed), during the past year more real work has been done.

The following Companies have come directly under my notice as having done good work in endeavouring to develop their properties.

Mount Lyell Comstock (late *Tasma*).—On this section prospecting is now being carried on.

Tasman Lyell.—This lease surrounds the Comstock. Considerable prospecting has been done on it; but this, with all other leases in its vicinity, are very much handicapped for want of a roadway, or what would be better, a tramway to carry goods and machinery.

I do most respectfully recommend that during the coming Session some steps be taken to lay down a tramway from the road between Queenstown and Gormanston, crossing the Mount Lyell Haulage Line, to this and adjoining mines.

North Lyell.—This Company has systematically prospected their property, and the result is, so far, very encouraging.

The existence of a large body of ore has been proved, and of a similar nature to that of the Mount Lyell Mine. There is every prospect of this Company soon coming to the front, and rapidly developing their property.

Lyell Tharsis.—This property adjoins the North Lyell on the south, and work is being done on it.

West Lyell.—Considerable prospecting during the past year has been done, the leases are at ient protected, and the Company intend resuming operations shortly.

Prince Lyell.—The holders of this lease are now in treaty with a foreign syndicate to carry on development of their mine. Over £2000 have been spent in prospecting.

Central Mount Lyell.—During the past year this property has been tested by the diamond ll and found to contain similar deposit to that on the Mount Lyell Company's; but, ortunately, in putting down the last bore, the drill got fast, and operations for the time being re been suspended.

South Lyell.—This Company are prospecting their ground with a considerable amount of ergy by trenching, driving tunnels, and sinking, and it is to be hoped their efforts will meet with success they richly deserve.

King Lyell.—The work on this claim has been continued steadily during the year, and a siderable amount of copper ore has been won. Prospecting is also being carried on by melling, and with good results.

Lyell Pioneers.—The deposit on this property is very similar to that on the King Lyell. The mpany have done a considerable amount of work, and I understand are now arranging to tinue to do so on a more extended scale.

Besides the properties above-mentioned, others have shown their *bona fides* by working, notably Linda Lyell.

The gold industry has not progressed so well, the principal reason being, I believe, want of pital to prospect at a depth, which in this District is essentially necessary.

A great assistance would be given if a sum were voted, as was done some eight or nine ars ago, to assist.

The Strahan Prospecting Association, Princess, Woody Hill, Macquarie, King River Sections, d the Guilfoyle all require assistance, and if it could be given this particular branch of our mining lustry would receive such a stimulant that good must result, and the amount advanced fully paid by giving employment and encouraging enterprise.

Alluvial mining has been carried on to a limited extent, the principal reason being that the mount of labour called for by the Mount Lyell Company has induced the alluvial miners to ke work instead.

From the above statement it can be clearly seen that the mining industry in the southern rtion of the Western District is gradually but surely progressing; much remains yet to be done, t, from what is already known, it is evident that the Western District will in the near future ove to be one of the richest in the Australian Colonies, and will be capable of supporting a large pulation.

Mr. Registrar Trgg reports:— North-Western Division.

As regards the mining industry in this division during the last twelve months, I think that on e whole there has been a slight improvement, but still, taking into consideration the large area of own mineral-bearing country in this division, mining still seems very much at a standstill. By ose most concerned, this condition of things is attributed chiefly to the want of tracks and roads d to the very high cost of getting the ore away.

It may be taken for granted that roads and tracks are badly needed, and also that the present avy packing and railway charges are likely to seriously affect the mines' margin between profit d loss; but still I am inclined to believe that the want of sufficient capital to develop the mines s had more to do with it than anything else, for, perhaps, with one or two exceptions, none of the ines are as yet sufficiently developed to be in a position to produce ore regularly. No doubt in e past a large amount of money has been spent on mining in this division, but it appears to have en spread over too large a surface, whereas if spent on two or three of the best properties the sults perhaps would have been different.

The output of this metal is not what it was formerly; but this, I understand, is caused chiefly Tin. the low price.

Mount Bischoff Company's Mine.—There is no falling-off here, the regular output being aintained.

Stanhope and Waratah Alluvial.—The results have been hardly payable, the low price of affecting both severely.

West Bischoff.—This is still idle.

Silver. *Heazlewood and Whyte River District.*—At the Magnet Mine (late Godkin) they are be employed sinking shaft and driving for bottom of winze in No. 5 level. The prospects of mine, I understand, are improving.

The Mount Stewart and Confidence Mines are still being worked, and the Mount Stewart m has just sent four (4) tons of ore away. At the Confidence several tons of ore have been raised, none sent away.

Work is still being carried on at the New Silver Cliff, about two miles from Waratah, some rich ore has been got.

But by far and away the best silver section at present in this division is the Magnet Mi (Bell's Section), about six (6) miles from Waratah. It is the best developed property, and has large show of very rich ore, but it is worked on too small a scale—some half dozen tributors—to of much benefit to any one. If worked on a large scale it would, no doubt, soon make a name itself.

Gold. *Alluvial.*—This is patchy and found in rich pockets, but those engaged, though the number not nearly so large as formerly, make a fair living.

Lode.—The Rocky River G.M. Co.—This property takes a leading place. Some six month ago they started to drive on a lode. At first it was but a few inches wide, but widened to eight (8 feet with clear walls; this continued to 45 feet, when the lode pinched, but made again. A wind is now being sunk on the lode, and is down 20 feet, and the lode is 15 feet wide and much mor solid, and carrying nice-looking copper pyrites. A few more feet will reach the level of the Why River, and below water-level a great improvement is anticipated.

Lucy Spur G.M. Co.—Here they are putting in a 200 feet tunnel to cut a lode found in th higher adit, which carried good gold and copper oxide in patches.

The Savage River G.M. Co. now have their tunnel in some 300 feet, and native copper ha lately been found on this section in the drive.

The Rocky River Limited Prospecting Association have driven 50 feet on their section, th whole face of the drive being gossan, pyrites, and quartz, from which assays of silver and copp have been obtained.

Specimen Reef G.M. Co.—This Company at present are driving through blasting ground reach a point under which a rich chute of gold was obtained in the upper levels.

Rio Tinto G.M. Co.—The whole of the work here is being confined to driving a deep-lev adit to test a pyrites formation, 380 feet in width. This formation has been cut at a depth of 2(feet, and the Company are now engaged in driving across it. So far 30 feet has been driven, an one vein of highly payable ore has been cut. The prospects of this mine are encouraging.

Little or nothing is being done on the Long Plains Section.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF MINES.

Mines Office, Launceston, 28th July, 189

SIR,

I HAVE the honour to report having taken up my duties as Chief Inspector of Mines in Mar last; but, owing to accumulation of office work and work as Government Geologist, I have not y been able to visit many of the important mining centres.

Mining Accidents.

The number of accidents reported for the year ending June 30, 1897, I regret to say, shows considerable increase on last year's figures, the total being thirty-eight, of which seven were fat as against twenty-three, including seven fatal, for 1895-6. Of the seven men killed, five we Europeans and two Chinese; and of those injured one was a Chinaman and the rest Europeans.

Two accidents to timber-cutters, one fatal and one serious, were not, strictly speaking, mining idents, and of the rest several were so trivial as not to have needed reporting; but mining nagers, who are only required to report accidents attended with serious injury, naturally prefer to on the safe side.

The causes of acccidents were as follows:—

Fall of Earth, &c.—Five accidents come under this heading, including two fatal ones to nese who were working alone in alluvial claims: one of these was due to a log rolling over on he man from the top of the face, and the other to the earth giving way in a face which had n dangerously undermined. Of the men injured two were Europeans and one Chinaman.

Falls of Coal were responsible for serious injury to two men and the death of another. In latter instance the accident was due to the man's own negligence in not putting in timber as ered, and in the former case every precaution appears to have been taken.

Falls of Rock in Underground Workings.—Seven accidents. Two men were rather seriously ured by a piece of rock falling down a man-way which they were ascending; the other five idents were very slight.

Falling Trees.—As mentioned above, one man was killed and another seriously injured through ng struck by falling trees when cutting timber.

Fall from Ladder, &c.—Three rather serious and one slight accident were due to falls of ious kinds.

Collapse of a Pass.—One man was killed by a pass collapsing as he was going to the sistance of his mate, who was drawing the logs at the bottom of the pass. The practice of awing timbers from disused passes cannot be too strongly condemned; but the men were their n masters, and no blame could be attached to anyone else.

Cage Accidents.—One man was killed and another slightly injured through attempting to ter the cage while in motion. Another man received severe bruises about the head through being uck by the cage. All these accidents were due to carelessness on the part of the persons injured.

Bucket Accidents.—One man was incapacitated for work for some weeks by being jammed der the centres of a shaft while being drawn up in a bucket. Another man was killed through e bucket on which he was standing falling away when about to descend. In this case action is ing taken against the mining manager for allowing the bucket to be used for raising and lowering men.

Explosives.—Two accidents arose from this cause. One man lost two fingers through a tonator exploding in his hand; another received a cut in the forehead when returning to a sup- sed missfire a few minutes after lighting the fuse. This accident might have been much more rious, and proceedings are being taken against the offender for a breach of Clause *g*, Sub- ction II., Section 102 of "The Mining Act, 1893."

Breakage of Ropes, &c.—Three accidents, one rather serious, happened through ropes and ains giving way, but no blame was attachable to anyone.

Machinery in Motion.—Two accidents, one resulting in a broken arm and the other very ght, were due to this cause.

Runaway Truck.—A lad had his leg badly broken through the truck on which he was riding tting beyond his control and colliding with another truck on the Montana tram, Zeehan.

Various Causes.—One man had his toe crushed when assisting to shift some heavy machinery, d another received slight injuries by being jammed by a piece of timber which he was helping to id underground. A lad employed as battery feeder had his hand badly crushed while changing a oe, through using his hand to shift the bumper instead of using the bar provided for that rpose.

In the majority of these cases the accidents were either due to carelessness on the part of the n injured, or were such as could not have been foreseen, and in only the two instances mentioned s it thought necessary to take legal proceedings.

The Mining Act, 1893.

Great laxity is still shown in many instances by mine-owners neglecting to register the names d addresses of mining managers, as required by Section 91. I have had considerable difficulty d a great deal of unnecessary correspondence in obtaining plans and sections of mine workings in ordance with Section 97. In future this will be more strictly enforced.

The General Rules under Section 102 are, on the whole, fairly well observed, but great care- sness is sometimes shown in the handling and storing of explosives, and the practice of using the cket for men to ride up and down on is somewhat common in the smaller mines. Many nagers seem to be under the impression that the bucket may be used for such purpose if safety aps are provided; whereas Sub-section xx expressly forbids it, except for the purpose of effecting airs to the shaft and in cases of emergency. Attention has also had to be drawn to Sub-sections . and XLI. requiring a regular weekly record of the state of the workings, &c. to be kept, and a py of the Act to be kept at the mine in addition to copies of the General Rules being posted up.

Inspector Harrison's Report on the West Coast District is enclosed herewith.

I have, &c.

J. HARCOURT SMITH, *Chief Inspector of Mines.*

Inspector HARRISON (stationed at Zeehan) reports:—

"In submitting my annual report to you I regret to state that the accident list is again a h one, being as follows:—Fatal, 2; serious, 7; not serious, 12; total, 21.

One of the fatal accidents was that of John Lee, a miner, who lost his life in endeavourin save his mate, who got caught by a run of mullock while drawing timber out of an old pass in Junction Mine. The other was J. Williams, who attempted to get into a cage in the Q Extended Mine while in motion. He was badly crushed against the opening set and died in a hours. He stated it was entirely his own fault.

By far the principal portion of the accidents are attributable to men's own carelessness.

Complaints. A number of complaints have been received and attended to.

Safety appliances. Cages and ropes have been submitted to the usual tests, and several of the latter condemn

Legal proceedings. In only one instance was it necessary to take legal proceedings. This was against an en driver for getting drunk and using abusive language.

Explosives. We have now three magazines on the field; they are kept in good order. The time has arrived when arrangements should be made for the storage of explosives at Mount Reid, Ring Dundas, and Gormanston.

General remarks. Although at one or two of the Zeehan mines there has been a falling off in returns, stil output from the field has been well maintained, the amount of ore sent away from the Ze Railway Station for the 12 months being 20,993·25 tons, valued at £226,514. The su attending pyritic smelting at Mount Lyell has caused considerable activity to be displayed in ope up the large formations at the Rosebery, Colebrook, Curtin-Davis, and Mount Reid Dist although I fail to see that much can be done towards the development of the Rosebery and brook fields until rail accommodation is obtained. In the Lyell District the regularity with w the big mine is being worked must be very gratifying to all concerned. Some of the mining panies in the immediate vicinity are now preparing to prove the value of their properties systematic manner. At the South Lyell a good main shaft has been started, and machinery ere capable of going to a considerable depth. The West Mount Lyell people have also started a shaft. At the North Lyell the late developments are of a most encouraging nature.

In the Tyndall District there are quite a number of shows waiting to be opened up wh motive power can be obtained. Amongst them is the Harris Reward; this is a splendid prospe show, but the water difficulty has stopped sinking to any depth. I understand the Manager prepared estimates for bringing in water from the hills as a motive power, and is now consu with his Directors on the matter. In all directions from Zeehan prospecting is being pushed al In the Renison Bell group and the West Coast Prospecting Association good work, with fair re is being done. At the Western and Montana mines preparations are being made for deep sink at the latter mine a very powerful pumping plant is in course of erection. In conclusion, I state that everything points to this West Coast becoming an immense mining field, carrying a heavy population.

ANNUAL REPORT OF THE GOVERNMENT GEOLOGIST.

Mines Office, Lanneeston, 28th July, 1

SIR,

I HAVE the honour to report, that since my appointment in March last I have visited prepared Reports on the Scamander Mining District, the Mineral District between Corinna Waratah, and the Shepherd and Murphy's Tin Mine, Bell Mount. With this is also pres Mr. Montgomery's exhaustive Report on the Lefroy Gold Field, which has already been publi

Diamond Drills.—No work has been done with either drill since I took charge, bu following particulars as to the work done previously are taken from records in this office:—

No. 1 drill was occupied until October 27th, 1896, in boring for coal at Sandfly.

Sections of No. 2 bore, and of No. 3 bore down to 591 feet 11 inches were published in year's Annual Report. No. 3 bore was continued to a depth of 626 feet 4 inches, the 34 feet 5 i

not included in published section being through dark jointy sandstone, sometimes micaceous, carrying occasional veins of calcite. Boring became so bad that this had to be discontinued on 20th July, 1896, without passing completely through the measures. No. 4 bore was started on 16th September, and on October 27th boring was discontinued at a depth of 358 feet, the last 9 feet 2 inches being through greenstone. A section of No. 4 bore is appended hereto, together with table showing the work done by the drills since 1882.

The net result of the borings showed that the quantity of coal in the Sandfly Company's property is much less than was anticipated from the outcrops, and it is very doubtful whether it would pay to do any more work on this field at present.

No. 2 drill has not been in use during the year.

Both drills are in a very bad state of repair.

I have, &c.

J. HARCOURT SMITH, *B.A.*, *Government Geologist.*

REPORT OF THE MOUNT CAMERON WATER-RACE BOARD FOR THE YEAR ENDING 30TH JUNE, 1897.

3rd July, 1897.

SIR,

WE have the honour to present the Report of this Board for the year ending the 30th June, 1897.

This Board has met as frequently as occasion required.

The staff consists of a Manager and three watermen and channel-keepers.

The duty of the Manager consists of the entire charge and supervision of the Race, which, with its branches, is thirty-three miles in length. He keeps all accounts, weighs the tin raised under the royalty system, and collects and accounts for the royalties thereon, prepares plans and specifications for all works of construction and maintenance, levels head and tail races for customers when required, and generally manages and supervises all matters connected with the safety and efficiency of the Race. His salary is £350 a year, with a cottage; he is expected to keep a horse, which is partly used for conveying tools and materials used on the works.

The duties of the watermen and channel-keepers are to distribute water to the customers, to do all work necessary night or day for the preservation of the safety of the Race, and for cleaning and keeping the same in order. Their duties are of a responsible nature, and any neglect of them would involve the Board in a loss which might entail hundreds of pounds to make good. Their pay is 8*s.* per day, with a cottage. The Board is of opinion that, considering the responsible nature of their work, the high cost of living, and the isolated lives of the men, these rates of pay are by no means excessive, and that any reduction would be false economy, and would not secure the watchfulness and care which is absolutely necessary.

The Race is in fair order; the flumings upon the old portion thereof, which, owing to the advanced state of decay into which they had lapsed, were the cause of a very considerable and increasing loss of water, and consequent diminution of revenue, are in process of being gradually replaced by earth channels, which work, when completed in a few months hence, will increase the revenue and add very materially to the safety of the whole work.

This work has been somewhat costly, but no doubt it has been true economy to have undertaken it, and when complete the cost of maintenance will be much lessened.

Owing to the low price ruling for tin during the whole year, the revenue, which is governed by the price of tin, has fallen considerably. This factor, coupled with the loss of water through the decayed flumings above referred to and the exceptional dryness of the season, have had the effect of reducing the per-centage of interest upon the cost of construction to 9*s.* 3*d.* per cent. for the year 1896-97 from 20*s.* 3*d.* per cent. for 1895-96. It is satisfactory, however, to note that there is no material falling-off in the quantity of tin won or in the number of miners employed.

It is also gratifying to find that the ground worked during the year maintains its aver richness, and that the whole of the water brought in by the race has been used.

The Statistics for the year are as follows:—

Average per week of claims supplied	18
Greatest number supplied in any one week	22
Present number supplied	14
Total number of heads of water supplied	4766
Tons of tin ore raised	133
Average number of miners employed—18 Europeans; 43 Chinese	61

	£	s.	d.
Total receipts for the year	850	11	6
Cost of maintenance and management	773	15	0
Paid to Public Debts Sinking Fund, 1896	156	12	5
Total cost of purchase and construction	33,900	4	9
Rate (for the year 1896) of interest upon the cost of purchase and construction	9s. 3d. %		

F. BELSTEAD, *Chairman of the Board*
C. O'REILLY,
SAMUEL HAWKES,
JOHN SIMPSON,
J. HARCOURT SMITH, } *Members.*

The Honourable the Minister of Mines.

DIAMOND DRILLS.

Statement of Work done to 30th June, 1897.

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance bored.	Average cost per foot, inclusive of Labour and Fuel.
	No. 1. Drill.			feet.	£ s. d.
1882-3	Back Creek—For Gold	Vertical	7	1330	0 10 9
1883	Lefroy—For Gold	Ditto	4	1011	0 5 3
1884	Tarleton—For Coal	Ditto	1	401	0 5 6
1886	Longford—For Coal	Ditto	2	1585	0 4 0½
1886-7	Harefield Estate—For Coal	Ditto	1	725	0 6 5
1887	Cardiff Claim, Mount Malcolm—For Coal	Ditto	1	562	0 17 11½
1888	Killymoon Estate—For Coal	Ditto	1	504	0 4 7¾
1888-9	Seymour—For Coal	Ditto	5	2266	0 7 8½
1889 } 1890 }	Beaconsfield (Phœnix G. M. Co.)—For Gold	Ditto	1	781	2 0 2
1890	Beaconsfield (East Tasmania G. M. Co.)—For Gold	Ditto	1	978	0 14 9½
1891	Spring Bay—For Coal	Ditto	4	937	0 6 10
1891	Ravensdale—For Coal	Ditto	1	114	0 11 1½
1891-2	Back River, Prosser's Plains—For Coal	Ditto	2	854	0 6 1¾
1892-3	Lefroy (Deep Lead Syndicate)—For Gold	Ditto	4	979	0 15 9
1893	Lefroy (East Pinafore Co.)—For Gold	Ditto	1	317	0 10 3
1895-6	Sandfly—For Coal	Ditto	4	2130	0 11 5
	Total		40	15,474	
	No. 2 Drill.				
1882	Beaconsfield—For Gold	Horizontal, underground	1	68	No record.
1883	Mangana—For Gold	Ditto	1	546	0 15 1
1884	Guy Fawkes Gully, near Hobart—For Coal	Vertical	1	612	0 5 6
1885	Malahide Estate, near Fingal—For Gold	Ditto	5	1397	0 5 6
1886	Carr Villa, near Launceston—For Coal	Ditto	1	571	0 5 4
1886-7	Waratah (Mount Bischoff Alluvial T. M. Company)—For Tin	Ditto	7	1548	0 6 1½
1887	Waratah (Mount Bischoff T. M. Co.)—For Tin	Ditto	7	841	0 11 8
1887	Ditto	Horizontal, underground	1	53	0 7 8
1888	Old Beach—For Coal	Vertical	1	593	Abt. 0 10 9
1888	Campania—For Coal	Ditto	1	600	0 7 7½
1888	Richmond—For Coal	Ditto	1	500	0 5 1¾
1889	Back Creek—For Gold	Ditto	4	787	0 8 5½
1891	Macquarie Plains—For Coal	Ditto	2	989	0 4 5½
1891	Jerusalem—For Coal	Ditto	1	344	0 4 9½
1892	Langloh Park—For Coal	Ditto	4	1249	0 5 3¼
1893	Southport—For Coal	Ditto	1	612	0 5 3
1894	Zeehan (Tasmania Crown S. M. Co.)—For Silver	Horizontal, underground	2	319	1 0 2½
	Total	...	41	11,629	

Aggregate number of bores 81
Total distance bored..... 27,103 feet.

J. HARCOURT SMITH, *B.A., Government Geologist.*

Launceston, 27th July, 1897.

APPENDIX.

No. 1.

COMPARATIVE Statement of Gold won during the Years 1880, 1881, 1882, 1883, 1884, 18
1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, *and the first Half-year*
1897.

YEAR.	QUANTITY.	VALUE.
	ozs. dwts.	£
1880	52,595 0	201,297
1881	56,693 0	216,901
1882	49,122 6	187,337
1883	46,577 10	176,442
1884	42,339 19	160,404
1885	41,240 19	155,309
1886	31,014 10	117,250
1887	42,609 3	158,533
1888	39,610 19	147,154
1889	32,332 13	119,703
1890	20,510 0	75,888
1891	38,789 0	145,459
1892	42,378 0	158,917
1893	37,687 0	141,326
1894	57,873 0	217,024
1895	54,964 0	206,115
1896	62,591 0	237,574
1897 for first half-year	26,749 0	100,308

No. 2.

RETURN showing the Quantity of Gold obtained from Quartz during the Years 1880, 18
1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 18
and the first Half-year of 1897.

YEAR.	QUANTITY.	VALUE.
		£
1880	34,345 ounces	130,622
1881	45,776 „	174,956
1882	36,215 „	137,183
1883	36,672 „	138,060
1884	30,540 „	114,630
1885	33,266 „	124,234
1886	25,004 „	87,516
1887	33,427 „	123,453
1888	34,156 „	126,139
1889	33,069 „	116,517
1890	17,829 „	64,184
1891	33,659 „	126,221
1892	34,386 „	128,947
1893	30,163 „	113,111
1894	52,239 „	195,896
1895	51,628 „	193,605
1896	59,453 „	222,948
1897 for the first half-year	25,540 „	95,812

No. 3.

TITY and Value of Coal raised during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, *and the first Half-year of* 1897.

YEAR.	QUANTITY.	VALUE.
	tons.	£
.....	12,219	10,998
.....	11,163	10,047
.....	8803	7923
.....	8872	7985
.....	7194	6475
.....	6654	5989
.....	10,391	9352
.....	27,633	24,870
.....	41,577	37,420
.....	36,700	33,030
.....	50,519	45,467
.....	43,256	38,930
.....	36,008	32,407
.....	34,693	27,754
.....	30,499	24,399
....	32,698	26,159
.....	41,904	33,523
r first half-year	20,700	16,560

No. 4.

PARATIVE Statement of Tin exported from Tasmania during the Years 1880, 1881, 82, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, *l for the first Half-year of* 1897, *compiled from Customs Returns only.*

YEAR.	TONS.	VALUE.
		£
.....	3954	341,736
.....	4124	375,775
.....	3670	361,046
.....	4122	376,446
.....	3707	301,423
.....	4242	357,587
.....	3776	363,364
....	3607½	409,853
.....	3775¼	426,321
.....	3764	344,941
.....	3209¼	296,368
.....	3235	291,715
.....	3174	290,083
.....	3128½	260,219
.....	2934	198,298
.....	2726¾	167,461
.....	2700	159,036
st half-year	1142½	70,122

No. 5.

RETURN showing the Number of Persons engaged in Mining during the Years 1880 *to* 1896 *inclusive, and first Half-year of* 1897.

YEAR.	NUMBER.	YEAR.	NUMBER.
1880	1653	1889	3141
1881	3156	1890	2868
1882	4098	1891	3219
1883	3818	1892	3295
1884	2972	1893	3403
1885	2783	1894	3433
1886	2681	1895	4062
1887	3361	1896	4350
1888	2989	1897, first half-year	4178

No. 6.

RETURN showing the Number and Area of Leases held under "The Mining Act, 1893," *in force on* 30*th June of each year since* 1892.

Nature of Lease.	In force on 30th June, 1892.		In force on 30th June, 1893.		In force on 30th June, 1894.		In force on 30th June, 1895.		In force on 30th June, 1896.		In force on 30th June, 1897.	
	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.
		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.
For tin, &c. at a rental of 5*s.* an acre	1857	89,962	1547	71,279	997	45,532¾	720	31,207	738	33,077	1150	56,493
For coal and slate, at 2*s.* 6*d.* an acre rent	47	6874	57	8963	23	4231	37	6551	37	5946	38	6105
For gold, at a rental of 20*s.* an acre	489	4606	501	4801	374	3532½	455	4366	602	5712½	615	5789
Water Rights, Mineral and Gold	173	812 sluice-heads.	185	890 sluice-heads.	198	866 sluice-heads.	176	755 sluice-heads.	160	808 sluice-heads.	155	774 sluice-heads.

No. 7.

RETURN of the Number and Area of Leases under "The Mining Act, 1893," *in force on the* 1*st July,* 1896, *issued during the Year ending* 30*th June,* 1897, *cancelled during the Year ending* 30*th June,* 1897, *and remaining in force on* 30*th June,* 1897.

Nature of Lease.	In force on 30th June, 1896.		Issued during Year ending 30th June, 1897.		Cancelled during Year ending 30th June, 1897.		In force on 30th June, 1897.	
	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.
		Acres.		Acres.		Acres.		Acres.
For Tin, &c., at a rental of 5*s.* an acre	738	33,077	619	33,025	207	9609	1150	56,493
For Coal and Slate, at 2*s.* 6*d.* an acre rent	37	5946	2	59	1	200	38	6105
For Gold, at a rental of 20*s.* an acre	602	5712½	252	2300	239	2223	615	5789
Water Rights, Mineral and Gold	160	808 sluice-heads.	23	38 sluice-heads.	28	72 sluice-heads.	155	774 sluice-heads.

No. 8.

COMPARATIVE Statement of Net Revenue from Mines, being Rents, Fees, &c. paid to the Treasury for the Year ending 30th June.

YEAR.	AMOUNT.			YEAR.	AMOUNT.		
	£	s.	d.		£	s.	d.
1880	8944	5	11	1889	17,254	9	0
1881	20,936	5	5	1890	26,955	4	9
1882	23,077	1	9	1891	37,829	16	5
1883	15,439	14	5	1892	17,568	18	4
1884	6981	11	10	1893	16,971	9	2
1885	11,070	5	7	1894	15,323	1	9
1886	12,523	10	4	1895	20,901	13	2
1887	14,611	11	5	1896	25,631	0	3
1888	23,502	8	4				

The above Statement does not include Stamp Duties upon Transfers of Leases and Registration of Companies, or the Tax payable upon Dividends, from which sources large sums are derived.

TOTAL Number and Area of Leases in force on 30th June, 1897.

MINERALS.	NUMBER.	AREA.
		acres.
Gold	615	5789
Silver	811	43,142
Tin	264	8756
Coal	26	4066
Iron	8	455
Limestone	9	1199
Lithographic Stone	2	417
Slate	3	840
Nickel	5	292
Wolfram	2	160
Galena	7	435
Bismuth	1	80
Precious Stones	1	80
Copper	43	2369
Copper Pyrites	6	307
TOTAL	1803	68,387

AVERAGE Number of Miners employed during the Year ending 30th June, 1897.

	Europeans.	Chinese.
Northern and Southern Division	970	...
North-Eastern Division	256	244
Eastern Division	630	82
North-Western Division	284	...
Western Division	1837	...
	3977	326

MINING Companies registered during the Year ending 30th June, 1897.

Number of Companies.	Capital.
54	£154,035

TOTAL Area of Land applied for during the Year ending 30th June, 1897.

Mineral.	No. of Applications.	Area.
		Acres.
Gold	331	3109
Silver and other Minerals	457	25,075
Tin	58	2050
Coal	4	585
TOTAL	850	30,819

In addition to the above, applications for 105 Water Rights for 553 sluice-heads of water were received.

MINES Receipts for the Year ending 30th June, 1897.

Head of Revenue.	Amount.		
	£	s.	d.
Rent under "The Mining Act, 1893," for Gold	6340	2	10
Fees " " "	1008	15	6
Rent " " for Minerals	15,748	18	
Fees " " "	2454	6	4
Rent of Diamond Drill	78	17	1
TOTAL	25,631	0	3

LEFROY GOLD FIELD, TASMANIA.

REPORT ON THE GEOLOGICAL STRUCTURE AND MINING DEVELOPMENT.

By A. MONTGOMERY, M.A., M.E., late Geological Surveyor.

Auckland, N.Z., 9th March, 1897.

SIR,

I HAVE the honor to forward to you the following Report on the Lefroy Gold Field, with accompanying illustrative plans and sections, embodying the results of observations taken during my geological survey of the district carried on at intervals during 1895 and 1896. The long delay in furnishing the Report is due to my leaving the service of the Government of Tasmania in November last and going to another colony, the pressure of business consequent on the change having made it quite impossible for me to write it sooner. The fieldwork of the survey was completed in October, 1896, and this Report therefore will only be up to that date, unless a later one is specially mentioned.

The object of the survey was to collect such information relative to the goldfield as would be useful in furthering its industrial development and to report the same for public use. Owing to my leaving the service of the Government of Tasmania at somewhat short notice, I regret to have been unable to accomplish this object as thoroughly as I should have wished, not having had time to search through old reports and newspaper files for full information as to workings which have been abandoned, or to engage in the extensive correspondence necessary to elicit particulars of the past history of various ventures from many persons on whose kind assistance reliance could have been placed. It is hoped, nevertheless, that this Report will greatly facilitate the task of getting a complete account of the mining operations in the goldfield, by pointing out the matters about which information is deficient, and by locating the position of the various workings. The latter have been very fully surveyed, and are shown in more or less detail on the plans herewith.

The district has been previously reported upon officially by Mr. G. Thureau, F.G.S., late Government Mining Geologist, in two Reports, entitled "On the Mineral Resources and Permanency of the Lefroy Gold Field," of date 29th April, 1882; and "On the Future Prospects of Deep Mining of Gold-bearing Quartz Lodes at Lefroy," dated September 25th, 1883. As both of these are now scarce and almost out of print, they are freely quoted from in this report in order that the information in them may be made more readily available. An *interim* Report on the Lefroy Gold Field by the present writer was also published in 1896, but the ground traversed by it is now more fully covered in this one. My Report, dated 15th August, 1894, on the Back Creek Gold Field also contains matter useful to be borne in mind when considering the Lefroy district, the two fields being adjacent and very similar in their geological structure.

Situation.—The Lefroy Gold Field is situated near the north coast of Tasmania, about seven miles east of the estuary of the Tamar (Port Dalrymple). It is reached by good roads from the towns of Launceston and George Town, being thus very easily accessible.

Topography.—The shape of the surface of the ground is shown on the accompanying General Plan of the District, much attention having been given to mapping the topographical features as correctly as could be done in the time at my disposal. The altitudes at various points marked on the plan are from measurements with an aneroid barometer, and are only claimed as approximately correct, the readings having frequently been taken in changeable weather, when barometric levelling showed very variable results. They are useful also as showing the parts of the district actually visited during the survey, and in those portions where no levels are given the topographical features are only roughly sketched in, and are not so reliable as in the closely surveyed parts.

It will be seen from the map that the principal portion of the field lies in the head of the basin of Blanket Creek, this containing all the more notable mines. In the south-west part and also along the western edge of the field, however, some of the lodes outcrop on the fall to Slaty Creek. The extreme south portion drains into the Fourteen Mile Creek, an affluent of the River Tamar, and the south-east and eastern parts are in the basin of Back Creek. The dividing ridge between the Blanket Creek basin and those of the aforesaid neighbouring streams is generally fairly high, from 400 to 700 feet above sea level, and can readily be traced on the map; it is broken by a low saddle near the old Prince of Wales mine. From the dividing ridge the ground rapidly falls to swampy flats along the creeks mentioned, some of which are little more than 100 feet above the sea. The Lefroy Post Office is about 390 feet above sea level.

Though the district is fairly hilly, none of it is difficult country for making roads, and transport of machinery to the various mines has usually been a very simple matter. Woodcutters getting timber and firewood for the mines have made innumerable cart tracks all over the field.

The country is covered with open eucalyptus forest, with light undergrowth of tea-tree, fern, and heath, thick green bush being only found in some of the deeper and more sheltered gullies at the head of Back Creek and Slaty Creek. In the neighbourhood of the Town of Lefroy and of the principal mines the timber has been greatly thinned out, but both firewood and mining timber are still plentiful within reasonable distances.

Geology.—The main geological features of the Lefroy District and the surrounding country were shown as early as 1865 in the late Mr. Chas. Gould's map of the Den goldfield, an examination of which shows that several of the best known Tasmanian formations are represented in the vicinity. As geological changes must have exercised an influence of some sort on the auriferous character of the lodes, it will be of interest, and possibly, in some ways, of practical importance, to trace them somewhat closely.

The general "country" of the Lefroy field is slate and sandstone of most probably Lower Silurian age, but few, if any, fossils have been found which would enable the age of the formation to be definitely determined. The strata have been folded strongly by lateral crust-pressure, and now are found dipping at all angles from horizontal to vertical. Along the main ridge to the east of the field,—the same which terminates at the coast in the Fourteen-mile Bluff,—I have noticed the beds dipping vertically, but in the principal mines they lie pretty flat, the dip as a rule being from 15° to 30°. Owing to numerous small bendings I have been unable to make out if there are any main anticlinal axes traversing the field. The main ridge on the east side of the field is generally pretty hard country, with much firm black slate, hard sandstone, and occasionally bands of quartzite and hornstone (dense flinty fine-grained rock.) The high ridge on the west side of the goldfield is also composed of hard slate in great part, some of it, near the George Town road having been quarried many years ago for paving and building purposes. The general strike of the strata is about N.W. and S.E., and it will be noticed on the topographical map that there are several well marked ridges which follow this course. The main ridges on each side, both east and west, of the goldfield also have this general trend, the harder bands of rock having resisted the erosive agencies that have cut deeply into the softer ones. It may here be pointed out that all the lodes which have been of much value lie in a central band of softer country running north-westerly between the two above-mentioned hard bands on the east and west sides of the field, and that while strong in the central area they become pinched and die out both east and west as they get into the hard flanking bands of country. To the south of the field also the favourable softer country appears to be covered by harder strata.

In my report on the Back Creek Goldfield it was noted that in the Australasian Slate Quarry and elsewhere the slates had a cleavage across the bedding planes of the strata, giving them an appearance of being nearly horizontally laminated, while in reality they had a high angle of dip; this same feature is seen in parts of the Lefroy field, especially in the range on the eastward side of it. In measuring the dip of the strata care has therefore often to be exercised that lamination due to slaty cleavage is not mistaken for the true bedding lamination.

Though I have been unable to get decided evidence of larger synclinal and anticlinal foldings of the strata, it is quite evident nevertheless that a very considerable thickness of the Lower Silurian formation is exposed at surface in this field, but the similarity of the beds throughout the whole region and the repetition of them due to faulting along the lines of lodes render it impossible to estimate at all closely what thickness the horizontal section discloses, though probably it is some thousands of feet. It is manifest therefore that enormous erosion of the Silurian strata has taken place since these were folded to their present angles of dip, and that consequently the country now at surface and containing the auriferous lodes was formerly deeply buried. Though we cannot tell at what period the lodes were formed, it is pretty certain that they were formerly much more deeply buried in the country than we now find them, prolonged erosion having removed immense masses of superincumbent rock. This is to be borne in mind in discussing the question of the apparent occurrence of the gold only in the superficial parts of the reefs.

The next formation in point of age after the Lower Silurian found in the Lefroy District is granite, a small area of which is found to the south-west of the field in the flats towards the head of Slaty Creek. It is noteworthy that in many of the best known goldfields of Australia granite is found penetrating Lower Silurian strata, giving some colour to the hypothesis that the lodes have been formed in fissures caused by plutonic fracturing of the country during the period of the outpouring of lavas of which the granites are the deep-seated representatives. From the fact that in Tasmania at Middlesex and Mt. Agnew the granite formation penetrates the Upper Silurian rocks, it is probable that we must refer its age to the end of the Upper Silurian epoch. As the granites are throughout the colony overlaid by the beds of the Permo-carboniferous system, it is plain that they are much older than these.

Touching the time of formation of the auriferous lodes, it may be mentioned that at Golconda quartz reefs containing gold traverse both Lower Silurian strata and granite, being thus plainly younger than the latter, while the common occurrence of reef quartz in the Permo-Carboniferous beds shows that lodes existed before these were laid down. We must not of course conclude that all our auriferous lodes are younger than the granite and older than Permo-Carboniferous, as they might be of very different ages in different localities, still such evidence as there is appears to point to their having been formed soon after the granite extrusions, about the close of the Upper Silurian period. In Tasmania the Permo-Carboniferous beds are generally very nearly horizontal, and show only rarely any considerable amount of induration and metamorphism, and this only when in close proximity to eruptive masses of greenstone; and they very seldom indeed carry quartz veins or anything approaching true lode matter, so it is clear that the auriferous lodes were formed before they were laid down. The lodes are therefore of very considerable antiquity, dating back to probably Devonian time or earlier. I wish to lay some stress on this, as it bears upon the question of the gold in the reefs lasting in depth.

The Permo-Carboniferous and Mesozoic Coal Measures are not seen in the Lefroy goldfield itself, but occur close by in the Tippagory Hills and at Mount George, also to the south east towards Karoola and Lilydale on the Scottsdale Railway. At one time they no doubt covered the Lefroy District as well, but have been entirely removed by denudation. The existing surface of the Silurian formation is probably not more than 1000 feet below what was the surface when the Permo-Carboniferous beds began to be deposited.

The Greenstone formation (diabase and dolerite) which succeeds the Coal Measures throughout Tasmania, is also seen at the Tippagory Hills, along the Tamar, and on the George Town Road, but does not come into the Lefroy field proper.

In Tertiary times the District has seen several important geological changes which must be referred to in order that the distribution of alluvial gold in the field may be understood. The history of the field in this period is quite similar to that of the Back Creek District described in a former Report, and evidence of corresponding movements of elevation and subsidence of the land all along the north coast of Tasmania is given in my Reports on the Beaconsfield Goldfield, the Gladstone District, Thureau's Deep Lead, the Table Cape District, and the Corinna Goldfield. In Miocene (probably) time the general level of the north of Tasmania, irrespective of the lowering of the surface by subsequent denudation, must have been some three hundred feet or more higher than at the present day. The deep valley of the South Esk, now filled—at Longford, for example—to a depth of a thousand feet with Tertiary sands and clays, was then cut out by the running streams and passed to the west of the Lefroy field at the foot of the Tippagory Hills. The old channel is traceable now as a wide belt of alluvial matter to the west of Slaty Creek, running along the flats to the east of Tippagory and crossing near Mt. Direction over to the Tamar valley. The Tertiary beds at Windermere and Dilston also belong to the filling of this old valley. The present outlet of the Tamar River through the rocky gorge of the Whirlpool Reach is of much later date of formation. At the same time that the Esk Valley was being cut out by erosion another deep gully was formed along the course of the present Blanket Creek, and yet another along Back Creek. Borings with the diamond drill have shown that these old valleys are as much as 250 feet below the present surface. At this time the Lefroy field must have consisted of high steep ridges and deep gullies. The gullies are now much filled with alluvial deposits, and the hills have doubtless been much worn away by the prolonged erosion to which they have been subjected, so we may assume that the ridges were much higher and the main gullies much deeper than those which we now see. The surface must at that time have presented a very rugged aspect. At a later period, however, a slow subsidence of the north part of Tasmania began, and the streams began gradually to fill up the valleys which they had eroded. As the subsidence went on the valleys became more and more filled up and the coast line receded inland further and further, till finally a more or less even beach covered the place formerly ridges and gullies. During this time also there were numerous outflows of basalt, which ran down into the gullies and there formed solid sheets of hard black rock. The sections obtained in the diamond drill borings at Back Creek and Blanket Creek prove that there was a succession of these basaltic flows, and that time enough elapsed between them to allow of the accumulation of considerable thicknesses of sedimentary material. The subsidence of the land and conseqnent burying of the old surface under masses of detritus must have gone on until the greater part of the Lefroy District was buried deep under alluvial gravels and sheets of clay and sand, for further inland in the neighbourhood of Launceston, and as far south as Campbell Town, we find that the accumulation of sediments went on until the mass was over 1000 feet in thickness, these Tertiary deposits being now found up to about 700 feet above sea level. At the time when the subsidence attained its maximum only the highest hills about Lefroy could have been uncovered by water.

At length, probably about the end of the period of volcanic disturbance to which the flows of basalt are due, the subsidence came to an end, and a slow movement of elevation of the land took its place, causing the sea to recede and exposing a dry surface once more. This appears to have gone on to within quite recent geological times, if not even now in progress, but the elevation was not so-

great as the preceding subsidence, and consequently we now find the bottoms of the old river valleys of the George's River, the Ringarooma, the Deep Lead at Beaconsfield, the Tamar River, and the Lefroy and Back Creek leads, all far below sea level at their seaward outlets. As soon as the surface was again exposed to the action of running waters the great mass of loose gravels and clays became greatly cut into by watercourses, and there was an extensive sluicing off of them back into the sea again. The direction of the watercourses would naturally be on the whole seaward, but their exact position would be due to quite fortuitous circumstances of the configuration of the surface at the time, and would not be sensibly affected by the presence of older water-channels buried deep below them. Instead of these old channels determining the course of the new ones, they to some extent prevent the formation of new ones by affording a subterranean outlet for water falling on surface, and so prevent it from exercising an erosive action. This is probably one cause of the phenomenon so often seen in deep alluvial goldfields of the deepest leads lying under hills. Though on the whole the present Lefroy streams follow pretty closely the older valleys, there are several good examples of existing hills covering deep channels, the gravel hill south of the East Pinafore shaft, the boulder hill between the junction of the Back Creek and Piper Roads, and that to the west of the Monkland mine, being cases in point.

The erosion of the surface has gone on constantly since it appeared again above the sea, and the greater part of the gravel covering has been sluiced away, so that now we only find traces of its former presence in detached patches left here and there on the slopes of the hills. As these usually carry some gold, and sometimes have been payable to work, they have attracted much attention from miners, and much wonder has often been expressed at the occurrence of rounded waterworn stones on hillsides where there are no streams to account for them. As the above explanation shows, they are only small remnants of a once much more extensive formation.

It may here be useful to digress to point out a consequence of the above series of geological actions which has often led to much useless work and frustrated hopes. The gravels spread over the field were all more or less auriferous, and as they became sluiced away by natural processes the gold became concentrated in watercourses and on the bedrock where the gravel had lain. In prospecting the hillsides it has been again and again assumed that gold found in the surface soil must necessarily have come from reefs in the vicinity, when in many cases it must be only the remains of a destroyed gravel bed. In such instances it has been frequently a puzzle to the prospector that the gold is much waterworn, but when the explanation is given it is seen that this is only what might be expected. In tracing trails of surface gold to their source on slopes where there has been no space for the metal to become abraded by water action, the only indication of their having come from a reef close at hand that is worth relying on in this field is that afforded by sharp unworn edges and adhering pieces of quartz. The trail must be of "reef gold," as miners call it, not waterworn gold.

There has been a large amount of erosion of the surfaces of the Silurian rocks since they have been denuded of their alluvial covering, and in consequence of this we often find large quantities of angular quartz in the soil, and in the valleys there are very considerable deposits of this material, often but little waterworn. These more modern angular and sub-angular quartz gravels are easily distinguished by their shape from the older alluvial gravels, in which the majority of the stones are very thoroughly rounded. The beach gravels, as is natural, have the stones very thoroughly smoothed and rounded, much more so than those belonging to the "leads" which have only been worn in running streams. A comparison of the degree of attrition exhibited by a gravel deposit will often give much useful information as to whether it belongs to the old leads (river gravels), the beach gravels, or the modern little worn detritus. The two latter sorts of deposits are much less likely to carry payable gold than the old concentrated gravels of the deep leads. The angular quartz in the surface soil is very easily accounted for. The bedrock is full of "leaders" and small veins and bunches of quartz, and as the slate or sandstone matrix weathers down to form soil, these are set free in profusion. The rains keep washing away the light clay and sand, and in course of time the surface becomes covered with the residual quartz, a foot of the surface in depth representing perhaps ten feet or more of the original matrix. There is a natural process of concentration of the indestructible quartz. This also is carried in time into the watercourses, and being hard resists breaking, and at the same time abrades and breaks up softer material, the result being that we find the greater part of the gravel to be composed of quartz, even though it forms only a small percentage of the total rock from which it is derived.

While the quartz is thus preserved and concentrated on account of its hardness and resistance to chemical change, any gold that may be in the surface soil becomes likewise concentrated and preserved by reason of its great weight, its metallic nature, and its chemical indestructibility. Sinking always to the bottom of any stream into which it is carried, it is greatly protected from the wearing and pounding that the quartz gravel receives, and therefore the latter must wear away much faster in proportion than the gold does. Prolonged sluicing of the auriferous material in watercourses and streams therefore result in the concentration of the gold from a large area into a comparatively small bulk of gravel. The more thorough the concentration and the greater the bulk treated, the more likely is there to be payable gold in the streams.

These well known principles are here reiterated for the purpose of introducing the subject of e alluvial deposits of the Lefroy field from an economic point of view, and discussing the elihood more particularly of the deep leads being payable, the consideration of this question being t undertaken at this stage while the geological history is fresh in mind.

Alluvial Gold Deposits.—Like most goldfields, the Lefroy District was first opened as an luvial diggings, and though this branch has never been of importance compared with the reefing, a rtain amount of it has been done more or less continuously, and a good deal of gold has been ised. Practically all the work has been shallow, the shafts rarely exceeding twenty feet in depth, d most of it has been round the heads of the deep leads.

Not much digging has been done on Slaty Creek or its branches. The creek running from ction 317-93G up to the old Rob Roy Mine has been worked in several places, but is poor, and a le gold has been got in some of the other branches. The large creek in Section 238-93G has o been worked with some little success. In both these instances the gold is mostly little water-rn, and the quartz gravel or "wash" is very angular, pointing clearly to both being derived from e adjacent reefs rather than from older alluvial deposits. From Section 160-93G to 182-93G there however, an interrupted line of heavy water-worn boulders, many of them granite and con-nerate, which is said to have yielded a very little gold, and which is clearly an old terrace or ach deposit. The same gravels are seen again on the George Town Road, close to Slaty Creek dge. Very similar conglomerates occur near Lilydale, but whether they come from a rock in e neighbourhood or are derived, as is more probable, from old Permo-Carboniferous conglomerate posits, I am unable to say. These boulders are unlike any of the "wash" I have seen in Lefroy, nich is all quartz and sandstone, except in a small patch on Section 119-93G, which appears to be the head of the Pinafore branch of the Blanket Creek lead. It is most probably a beach deposit, e boulders being of rock quite foreign to the locality, and being on both sides of the high divide tween Slaty Creek and Blanket Creek. Possibly they were brought down from the vicinity of ount Arthur into the old Tamar River, and thence distributed along the beaches near its mouth. hey are not therefore likely to be worth working for gold, beach deposits being rarely sufficiently ell concentrated for gold to be profitably extracted from them.

Blanket Creek and its branches have yielded the bulk of Lefroy's production of alluvial gold. he position of the more important workings is marked on the general plan of the District, and it obvious that in the majority of cases the gold was got in the heads of leads running into the deep ab-basaltic channel of the Lefroy Main Lead. Beginning at the north we first find the Old inafore lead, worked in Sections 83–93G and 155–93G. This has been very thoroughly rooted up or about two to three chains in width, but going to the north-east the ground became deep, and nally basalt was struck, after which the lead was not followed further. At the south-west end the ld gravel deposit becomes washed out, but reappeared again as a shallow patch towards the south-est of Section 156–93G; the wash in this lead contained large well-rounded boulders. From its ermination south to the New Pinafore shafts a good deal of gold has been washed out of a wide lat patch of very angular quartz debris, evidently shed from the New Pinafore lode. While the Old Pinafore lead probably derived its gold from the Chums lode in great part, from portions which once stood much above the existing surface and have been completely washed away, the angular "wash" seems likely to have come from the New Pinafore reef quite as much as from the Chums' line. We have here an instance of the modern angular "wash" being gold-bearing, and lying close to an older well water-worn gravel.

The next alluvial workings worth noticing are in Section 119–93G, already referred to as carrying granite and conglomerate boulders, similar to those on the fall to Slaty Creek; some fairly coarse gold was got in these workings. Two small shafts marked on the plan to the north-rest of the alluvial diggings are sunk in gravel, much of which is well rounded and of the beach ype, and probably there is here a river gravel in the gutter of the lead with beach gravel overlying . This place appears to be most probably the head of a large branch of the Blanket Creek ain Lead (Lefroy Main Lead), which has been traced up from the East Pinafore shaft into ction 847–87G. In the S.E. angle of 372–87G one of the West Pinafore shafts proved the uvial matter to be about fifty feet deep, but the gutter was not cut. The basalt comes up close this shaft. This branch of the main lead was also struck in a cross-cut north from the old lden Era shaft, and has been well proved by costeening on Sections 363-87G and 974–87G. cept in the shallow workings at the head of the lead, the centre of the lead or gutter has never n seen.

On Section 746-87G there was some gold got in shallow workings at the head of a small gully ich cuts the Bendigo Reef, the gold being just below the outcrop of the reef and evidently ived from it; but these diggings were quite unimportant.

Similarly on Section 245-93G there was a good deal of digging near the outcrop of Bain and hards' reef, but in this case it is probable that most of the gold came from older gravels which e been entirely removed.

Along Sludge Creek, from Section 848-87G southwards, there has been much digging, some of the gold being derived, doubtless, from the outcrops of the Morning Star, Native Youth, and Golden Point and Crown lines of lode, but probably in the main belonging to the older river system, and therefore possibly brought down for some distance. There is a line of deep alluvial ground running up the Sludge Creek valley, but older than the present creek. It is cut by the George Town Road, and in the cuttings shows soft clays mixed with a good deal of sand, from which springs of water issue, much to the detriment of the road. At the north end the lead disappears under basalt.

A little alluvial work has been done on Section 332-93G on modern surface drift carrying a small amount of gold. In the branches of Sludge Creek running up through Section 1029-87G to the Windermere mine there has also been a little digging.

Towards the south-east corner of Section 248-93G a lead known as "Kerrigan's" runs right across the spur on which the road from Launceston comes into Lefroy, showing very plainly the difference that there must have been in the former shape of the surface and the present one. This yielded some fair returns of gold. The "wash" was well waterworn. The lead goes down into deep ground under the Recreation Reserve, and plainly belongs to the pre-basaltic system of leads. Another little branch has been worked in the south part of 178-93G.

One of the best alluvial gullies on the Lefroy field has been that known as "Poverty Gully," running from near section 1015-87G into 91-93G. From the way in which this goes down to the deep ground at Blanket Creek I am disposed to surmise that it belongs to the older system of leads, but it might quite well be a modern one. It possibly is a modern watercourse which has become the receptacle for the gold from a quantity of older gravels now removed. Such older gravels are seen close by on Section 234-93G, where there is a spur with a heavy covering of beach gravel upon it.

In the flats up Blanket Creek, above the bridge on the Piper Road, gold may be got in wash up to 16 or more feet in depth which belongs to the older river deposits. Basalt comes in on the east side of these gravels, and it appears most probable that they are on the margin of a lead which runs up the eastern side of a steep slate spur east of Section 261-93G. On this side the ground is very deep, and the gravel, of beach type mainly, runs southward to a point near the S.W. corner of Section 108-93G. Close to where it gives out there is an old shaft, said to be 70 feet deep, sunk all through gravel.

On the east side of the Blanket Creek valley I do not know of any alluvial workings worth referring to.

At the head of Back Creek there are some patches of alluvial workings all on the older gravels belonging to the Back Creek deep lead. One of these is near the east boundary of Section 232-93G, and near it the creek itself has yielded some gold, no doubt derived from the older gravels. On Section 132-93G and on the adjacent block purchased by R. L. Davidson there is a gravel hill in which shafts over 40 feet in depth have been sunk without reaching bed-rock, and some gold has been obtained. The gravel on surface is most likely of beach origin, but under it are layers of silt, clay, and sand, and the gutter, which has not yet been seen, will probably contain river gravels. This lead runs through Woodward's farm into the main Back Creek lead. From 132-93G up to the Vidette mine some alluvial workings on a small creek are probably on gravel of more recent deposition.

On Section 377-93G there is a wide deposit of somewhat shallow gravel, which has been worked a little, with very poor results, by the Lefroy Hydraulic Sluicing Association, No Liability. This gravel probably belongs for the most part to the later stages of filling of the Blanket Creek valley, and very probably much of it was laid down later than the basalt flows, so is not likely to carry much gold. In gutters in the bed-rock there is, however, a chance that there may be richer deposits.

Looking at all the alluvial deposits as a group, it is at once visible that all the important leads have gone down into the deep ground under the basalt where they could not be followed without good machinery for pumping water. It is also worth noting that gold has been found, in amount worth working, in every place where we come upon the ancient river gravels. The extent of these old gravels that we have been able to get at is, however, very small, and it is not generally recognised that for the amount of gravel available the returns of gold have been fairly good. It is clear that we have only been able to get at short pieces of several branch leads, and the inference is that there must be a great deal of gold in the main lead. This is the main sluice into which all these little leads have discharged, and which has received the material from a large extent of known auriferous country. It is possible and probable that the drainage area of the old creeks was much more extensive than that of those we now have, and that much of the country to the south of Lefroy, now covered with alluvial matter of Tertiary age, yielded gold to these old streams. The field even as we know it, however, is full of proved auriferous reefs, and an immense amount of denudation

of these must have gone on in the early Tertiary days when the ridges were steep and the gullies deep. Conditions were then much more favourable for wearing down the rock and concentrating the gold in the main gullies than they are now. There is every reason to believe, therefore, that the main lead will contain gold enough to be worth working, and it seems to me quite a fair mining enterprise to thoroughly test the matter.

The main lead and its principal branches are covered with basalt, and their positions are marked in on the general plan of the district with approximate accuracy. The plan also shows the position and altitude of the shafts and bores which have been put down to test the deep ground. It will be convenient to note the results obtained at each of these separately, as follows :—

(i) *Rock shaft*, near south boundary of Section 692-93G.—Close to Diamond Drill bore No. 1 of the series put down in 1883. Altitude of surface 254 feet above sea level. Mr. Thureau in his Report of Sept. 29th, 1882, says of this :—"A shaft had been sunk to a depth exceeding 100 feet through hard basalt without reaching either the wash or the bedrock." Elsewhere in the Report the depth is given as 102 feet.

(ii) *Golden Era shaft*, 305 feet above sea level.—This is shown on the general plan on the centre of the boundary line between Sections 373-87G and 821-87G. Mr. Thureau, in the above Report, refers to the deep ground thus:—"At the 170 feet level, in prospecting for auriferous quartz in a north-easterly direction from the shaft, the black clay (diluvial) was broken into at a distance of 140 feet of said shaft. The clay referred to varies in colour from black to brown, in which flakes of grey slates and fragments of fossilised woods (lignites) are embedded. The company continued their main drive at nearly the same level in this wash for 60 feet farther, when they again met with the rising Silurian bedrock. Several shafts were sunk below the level in this deep diluvial channel, by means of which it was ascertained that the bottom existed some 15 feet lower, or about 185 feet from the surface. The gravelly wash is yet irregular, very large rounded boulders, chiefly of quartz and sandstone, occur above and below the lignites, demonstrating very considerable fluviatile action in pre-historic geological times. The pan prospects obtained from the western sides of the channel were satisfactory, as they gave coarse heavy gold of a very high quality, the other residues being chiefly composed of iron pyrites, which are prevalent in the lower stratum of the wash." The work was carried on under great difficulties with ventilation and water, and had eventually to be suspended.

(iii) *East Pinafore shaft*, 291 feet above sea level.—This shaft was sunk to a depth of 191 feet by the Company, mostly through hard basalt, often scoriaceous, and then a diamond drill was put on to bore for the bedrock. It passed through 12′ 4″ of rubbly basalt, 16′ 2″ of hard basalt, 8′ 6″ of brown clay, fine gravel, and decayed wood, and 8′ 0″ of gravelly wash, "floating reef" (*i.e.*, fragmentary lumps of bedrock) and wood, and struck soft slate bottom at 236′ 1″ from surface. The shaft was afterwards sunk deeper, and the wash was found to contain payable gold, but was dipping out of the shaft, the gutter being still deeper. Some alluvial work was then done from the shaft, and some fairly good wash was obtained, but there was much water to contend with, and the Company discontinued trying the wash, and went on with work on the Pinafore reef. The prospects of alluvial working were generally considered favourable if a shaft were put down in a better place for working the wash, and powerful pumps were provided.

Rock shaft, No. 2, 209 feet above sea level. About 5 chains N.W. of the N.W. corner of 89-93G there was a shaft put down near Blanket Creek to try to get into the deep ground. After passing through some 70 feet of soft black sandy material containing liguite, basalt was struck, and also a great deal of water, and work was abandoned. I am not at all sure that the depth quoted is correct, but otherwise the facts are fairly so.

DIAMOND DRILL BORES, 1883.

No. 1 Bore.

254 feet above sea level, near south boundary of Section 692-93G. The following Section was obtained :—

Strata.	Thickness.	Total Depth.
	ft. in.	ft. in.
Surface clay, earth, &c.	8 6	8 6
Rubbly basalt	12 6	21 0
Basalt	154 6	175 6
Sandy clay, brown clay, and wood	16 6	192 0
Wash	0 6	192 6
Sandy clay and floating reef	27 6	220 0
Sandstone bottom	26 0	246 0

No. 2 Bore.

194 feet above sea level. Near N.E. corner of Section 1003–87G.

Strata.	Thickness.	Total Depth.
	ft. in.	ft. in.
Clay	3 0	3 0
Gravel and clay	9 0	12 0
Rubbly basalt	10 0	22 0
Basalt	141 4	163 4
Black clay	1 8	165 0
Brown clay	2 0	167 0
White sandy clay and fine gravel	2 6	169 6
Floating reef, gravel, and sand	13 8	183 2
Brown clay and wood	2 6	185 8
Sandy clay and wood	20 4	206 0
Sandy clay..	14. 0	220 0
Slate boulder	0 6	220 6
Sandy clay and fine gravel	29 6	250 0
Sand and gravel	4 0	254 0
Slate bottom (not altogether certain, as no core was got)	10 0	264 0

No. 3 Bore.

211 feet above sea level. About 4 chains S.S.W. of S.W. corner of Section 88–93G.

Strata.	Thickness.	Total Depth.
	ft. in.	ft. in.
Clay	6 0	6 0
Soft rock and clay	14 0	20 0
Basalt	150 9	170 9
Black clay	3 0	173 9
Brown clay	6 6	180 3
Floating reef and fine gravel	4 0	184 3
Clay and fine gravel..	4 0	188 3
Clay and wood	6 0	194 3
Floating reef, gravel, cement, and wood	6 0	200
Brown sandy clay	18 0	218
Sand, clay, floating reef, and gravel	4 0	222
Sandstone bedrock...	16 0	238

No. 4 Bore.

197 feet about sea level. 164 links N.W. from N.E. angle of 81–93G.

Strata.	Thickness.	Total Depth.
	ft. in.	ft. in.
Clay	9 0	9 0
Rubbly basalt	21 0	30 0
Basalt	96 6	126 6
Basaltic clay	16 0	142 6
Brown and black clay, wood, and fine gravel	1 0	143 6
Wash (gravel)	4 6	148 0
Vesicular basalt	3 3	151 3
Basalt, some of it vesicular	30 3	181 6
Basalt	14 0	195 6
Basaltic clay	0 6	196 0
Black clay	3 0	199 0
Brown clay	21 10	220 10
Sandy clay	1 0	221 10
Gravelly wash	3 6	225 4
Pipe clay	15 0	240 4
Sand and wood	3 0	243 4
Gravelly wash and wood	4 10	248 2
Gravel	0 6	248 8
Sandy clay, gravel, floating reef, and wood	8 0	256 8
Gravelly wash	6 10	263 6

It was not certain if this bore reached bottom. Some gold is reported to have been got in the lowest gravel.

DIAMOND DRILL BORES, 1892.

No. 1 Bore.

163 feet above sea level. About six chains S.E. of S.E. angle of Section 892-870.

Strata.		Thickness.	Total Depth.
		ft. in.	ft. in.
e material, clay, earth, &c.		11 4	11 4
ceous vesicular basalts		24 10	36 2
, more solid	77′ 11″	16 6	52 8
ılar basalt		36 7	89 3
ned brown fine sand		4 0	93 3
vesicular basalt		11 2	104 5
brown compacted fine sand		4 6	108 11
sh grey compacted fine sand		2 8	111 7
coriaceous basalt		6 2	117 9
ı sandy clay		2 11	120 8
sandy clay		1 0	121 8
acted coarse and fine sand and fine gravel with peaty markings		2 3	123 11
sh sandy clay with peaty markings		8 0	131 11
ı compacted fine sand and mud with carbonaceous markings		12 5	144 4
, partly vesicular		28 4	172 8
ı compacted fine sand and mud		2 9	175 5
coloured bluish slate (bottom)		15 1	190 6

No. 2 Bore.

160 feet above sea level; 3½ chains east of No. 1 Bore.

Strata.		Thickness.	Total Depth.
		ft. in.	ft. in.
e soil, &c.		14 0	14 0
lay		1 0	15 0
ubbly basalt		57 4	72 4
brown clay		1 9	74 1
y basalt		2 4	76 5
ı clay		0 10	77 3
y basalt		8 7	85 10
lay		1 10	87 8
ı sandy clay with slate and quartz pebbles and decayed wood		6 3	93 11
andy clay and decayed wood		8 7	102 6
ı clay with carbonaceous matter		21 9	124 3
, vesicular	6′ 1″	75 9	200 0
, very hard	69′ 8″		
clay		1 0	201 0
clay and carbonaceous matter		3 3	204 3
gravel, floating reef, and decayed wood		10 8	214 11
ish sand		2 6	217 5
gravel, floating reef, and wood		2 11	220 4
ndstone, showing quartz veins		22 6	242 10
No gold found in the bore.			

No. 3 Bore.

164 feet above sea level. Over 3½ chains, E.S.E. of No. 2 Bore.

Strata.		Thickness.	Total Depth.
		ft. in.	ft. in.
e soil, &c.		8 6	8 6
ubbly basalt		68 0	76 6
clay		2 5	78 11
r basalt		5 9	84 8
clay		2 0	86 8
clay, fine gravel, floating reef, and wood		6 5	93 1
ndy clay and wood		6 6	99 7
clay and carbonaceous matter		29 2	128 9
vesicular	38′ 8″	80 9	209 6
hard	41′ 0″		
soft	1′ 1″		

No. 3 Bore.—*continued.*

Strata.	Thickness.	Total Depth.
	ft. in.	ft. in.
Black clay	2 0	211 6
Brown clay	0 6	212 0
Gravelly wash, floating reef, and decayed wood	10 3	222 3
Brown sandy clay and wood	2 6	224 9
Coarse gravel, floating reef, and decayed wood	3 9	228 6
Blue sandy clay	4 10	233 4
White sandy clay	2 0	235 4
Brown sandy clay and wood	3 4	238 8
Sandstone boulder	5 0	243 8
Gravelly wash and floating reef	7 5	251 1
Soft sandstone bottom	15 5	266 6
No gold found in the bore.		

No. 4 Bore.

197 feet above sea level. About half a chain S.E. of the No. 4 bore of the 1883 series, as to which there was some doubt if the bedrock had been reached.

Strata.	Thickness.	Total Depth.
	ft. in.	ft. in.
Surface clay	9 0	9 0
Basaltic boulders	9 0	18 0
Basaltic clay	6 6	24 6
Basaltic boulders	2 0	26 6
Basalt, rubbly 13′ 8″ / Basalt, solid 83′ 8″	97 4	123 10
Black clay	6 5	130 3
Brown clay, floating reef, and fine gravel	5 0	135 3
Brown sandy clay and wood	9 3	144 6
Basalt, vesicular	51 10	196 4
Black clay	1 6	197 10
Brown sandy clay and wood	22 8	220 6
Gravelly wash, wood, and pyrites	5 7	226 1
Whitish sandy clay, fine gravel, and floating reef	5 2	231 3
Bluish clay, fine gravel, and floating reef	1 11	233 2
Whitish clay	4 0	237 2
Brown clay and wood	1 0	238 2
Sand and wood	2 6	240 8
Gravelly wash with much pyrites	8 4	249 0
Bluish clay, fine gravel, and sandstone boulders	2 6	251 6
Gravelly wash 11′ 2″ / Gravelly wash, with large sandstone boulders 7′ 4″	18 6	270 0
Soft sandstone bottom	9 0	279 0
No gold found in the bore.		

The above quoted evidences prove conclusively that under the flat ground along Sludge and Blanket Creeks there is a deep buried valley, which we may call the Lefroy main lead. Its position is best indicated on surface by the basalt, which formerly ran in a liquid state over the lowest ground. A glance at the positions of the above bores on the plan shows that they were all to the west of the centre of the basaltic area, and the three most northerly bores getting successively deeper going eastward prove that the deepest channel has not yet been located, but is probably still further east. Several more bores should be put down in a straight line across the basaltic area, in order to find the position of the gutter, and also to show how near to it it would be possible to get a shaft in solid ground. It would be useless to sink a shaft right on the gutter, as the subsidence of the loose material round it on withdrawal of the water by pumping and when extraction of wash began would destroy the shafts. The best practice in such cases is to sink the shaft in the bedrock to one side of the lead and drive thence in solid country under the gutter, but, owing to the width of the alluvial ground in the Lefroy lead, this course would necessitate a long crosscut, which would make trucking the dirt expensive. By taking advantage of the presence of strong layers of basalt in the lead, shafts could be pretty safely sunk to strike the bedrock where the edge of the lowest basalt layer rests upon it, all the upper portion of the shaft being thus in ground resting on the sheets of basalt, and so not likely to be affected by working out the wash. In this way the working shafts could be got fairly near to the gutter. It would probably, however, be advisable to

have them made round, and lined with cast-iron tubing, to best resist the pressure of the sedimentary layers between the basalt sheets, and to dam back the water in these as much as possible.

There will be, without doubt, a good deal of water to contend with in working this lead, especially at first. The gutter lies a long way below sea level, and must form an underground reservoir of water, which must be pumped out. The catchment area of the lead is not, however, large, and when the accumulated water is mastered there should be no trouble in keeping down the ordinary influx. It does not appear to me to be a mining venture of any extreme difficulty to open this lead, but it would certainly require a heavy initial expense. A company undertaking it would do well to have a working capital of not less than £50,000.

Before sinking a shaft further boring with diamond drills is a necessity, to prove the depth of the gutter. They should not be relied upon to prove the value of the wash, the core being too small to give any information worth having on this point. The gold is so irregularly distributed in an alluvial deposit, and is as a rule so closely confined to the bottom layer, that the chances are greatly against the small piece brought up by the drill being a fair representative sample of the whole. This was well shown by the bore in the East Pinafore shaft: the cores brought up by the drill were thoroughly washed but gave no gold, yet when the shaft itself was sunk to the bedrock gold was found all over the bottom. The drill should therefore be relied on only to ascertain the depth of the ground and the thickness and general characters of the layers of wash; if the latter are satisfactory the presence or absence of gold in the core is a matter of little consequence. The evidence as to the gold-bearing character of the lead rests on a far wider basis. Wherever we have found the heads of branches running into the main lead there has been gold in them, often fairly large nuggets, and it stands to reason and experience that the main channel should be much richer than the branches. It is seen from the plan that the lead runs right across the numerous auriferous reefs of the district, and for ages these must have been yielding their gold to it. It would be hard indeed to find a lead more certain to contain a great deal of gold, and I have much confidence that it will yet be profitably worked. It may well prove to Tasmania what the Ballarat lead has been to Victoria, and every encouragement should be offered to induce a powerful company to undertake the enterprise of opening it up. Success in this would mean the establishment of a large alluvial mining industry not only at Lefroy, but also on the deep leads at Back Creek and Beaconsfield, and possibly also on the Piper River, which would then be sure to receive attention.

The likeliest place for a good deposit of gold in the Lefroy main lead is at and below the junctions of the three main branches, which we may call the East Pinafore lead, the Sludge Creek lead, and the Blanket Creek lead. The junction of the Old Pinafore lead with the main one would also be worth looking for. The main pumping station should be as far as practicable down the lead so as to unwater the greatest possible length of it.

Auriferous Reefs or Lodes.—The positions of all the principal lines of lode yet discovered are shown on the plan of the District. It will be seen that the general strike is more or less east and west. The central parts appear to be nearly east and west in strike, but the ends show a tendency to bear off to the south of west and north of east, giving a general strike approaching E.N.E. and W.S.W. The lodes are also strongest in the central parts, and appear to die out and split into narrow veins as they get into the belts of harder country which, as previously remarked, form the flanks of the productive portion of the field. This zone runs north-westerly, concordantly with the strike of the Silurian formation, and the reefs to the north of the field extend further west in consequence, while those in the southern parts run furthest east, the lodes being *en échelon*.

Very few cross-lodes of any consequence have been discovered, the principal one being that worked by the Golden Point and Crown Company on Section 160–83, which runs north-easterly. There are, however, in various parts of the field a number of lodes running north-westerly, agreeing in strike with the Silurian strata, but I am not aware that any of these has been clearly proved goldbearing, and certainly none of them have yet been mined upon seriously. They usually present outcrops of slaty gossan mixed with vitreous-looking quartz, and do not seem to have any connection with the auriferous series of lodes. They are also found in the Back Creek goldfield. They have not been considered worth surveying and marking on the plan.

The auriferous lodes are in lines of faulting of the country, the wall-rocks being usually distinctly different on each side of the lode-channel, though it has not been hitherto possible to measure the extent of the vertical displacement of the strata. The bending down of the lines of reef to the southward in the centres is doubtless due to the faulting movement being there greatest. It seems certain that faulting movements of the country along the lode fissures have gone on for a long time, and at widely separated intervals of time, resulting in repeated reopening of the fissures and consequent formation of wide channels of squeezed and broken material along them. From time to time quartz has been found in the fissures, sometimes auriferous, sometimes not, and the movements of the walls have frequently broken this after it has been deposited. It seems probable that the gold-bearing quartz was among the first deposited, for we sometimes find pieces of it

attached to the walls and with valueless quartz upon it, separated by a mere joint, the face of this being frequently a slickenside. Some curious results of the movement of the walls after the deposition of the gold have been noticed. For example, in the Waverley mine a flat, loose, bent flake of auriferous quartz was found lying almost at right angles to another flake attached to the lode-wall, the first one being most probably carried down from its original position higher up. In the same mine the writer has seen stones of quartz with a streak of gold on the surface, caused by an auriferous specimen being crushed over it. Slickensided quartz in the Volunteer mine has more than once been found, with polished gold showing in the smooth face, and occasionally with a streak of gold below the imbedded grains, due to portion of these being rubbed off by the moving wall. In this mine also, in driving through a portion of the lode-channel filled with broken country and mullock, pieces of auriferous quartz have been found, angular in the main, but with more than one surface polished and striated, evidently a portion of the auriferous reef torn from its original position. Slickensides are very common in the Lefroy reefs, some of them very highly polished and of great extent. In the upper levels of the Volunteer mine the hanging-wall of the reef was often one polished mirror-like surface for many square yards at a time, and the same feature has been seen in parts of the lower levels. The New Pinafore main wing, below the 800 feet level, also showed a very fine slickenside of great extent, the upper side of a layer of quartz on the footwall of the lode being splendidly polished. The quartz contained a good deal of pyrites, and this mineral had also been deposited, particularly along the hanging-wall of it; the polished face was often quite metallic-looking with the bright smoothed pyrites. Another notable slickenside, over 50 feet in depth, is seen in an underlay shaft on one of the Sentinel's Company's lodes, near the top of the high ridge in their northern section.

In the New Pinafore mine the effect of the movements of the walls has been usually to shatter the auriferous quartz so thoroughly that it forms a rubbly mass, often with a good deal of intermixed mullock, a feature noticed also in the Clarence and Recruit mines. In one part of the Clarence mine nothing was left of the auriferous lode but a thin streak, about an inch thick, of clay and finely ground-up quartz, with small angular fragments of quartz, on the footwall.

The reiterated movements of the walls of the reef, besides tearing up and shattering the sheets of quartz first formed, have caused a great deal of wall-rock to get into the lode-channels, where it has been crushed to mullock and pug, or, if not so thoroughly broken as this, has been squeezed until the bedding laminations of the slates present remarkable contortions and twistings. Where a large mass of country rock occurs in the lodes, as is very frequently the case, the bedding is very irregular, and the mass is commonly broken by numerous slippery smooth joints, and full of irregular veins of barren quartz. The lode-channels are often from 50 to 100 feet wide between the main walls, there usually being a fairly well-defined lode on each wall, sometimes of quartz, oftener of a mixture of quartz, lode-slate, and mullock. The large "horse" of country between is generally much broken, full of slides, and seamed with irregular quartz veins. Where it is composed of soft slate the whole channel may be little more than soft mullock, but where it is hard sandstone it is frequently somewhat difficult to say that the solid wall-rock has not been reached. The jumbled stratification is then often a good guide, the true solid wall-rock generally being very regularly stratified.

It is usual in this district, as in a great many others in the Australian colonies, to refer to the whole of the lode-filling between the main walls as the reef or lode "formation," a somewhat unfortunate term, as it has another restricted geological meaning. It includes quartz, pug, mullock, and "horses" of lode-slate; in fact, everything between the main walls. In several instances there is a more defined lode of quartz, &c. on each main wall, each of which has its own hanging and foot-walls quite well defined, and there are sometimes also intermediate lodes and walls, all in one large "formation." From a geological point of view we must regard the whole "formation" as the lode, while for mining purposes only the quartz-bearing portions are so spoken of. From the way in which the lode-channels have been filled, reopened, and refilled, several times in succession, perhaps, we can have no rule as to where the auriferous material is to be found; it may be on the footwall in one place, on the hanging-wall in another, and in the middle of the "formation" in a third place; or, it may be so much broken up as to be scattered in bunches through the "formation." This adds very much to the difficulty of mining the quartz, as more or less exploration work has to be kept going on all parts of the "formation" in order to locate the payable ore. Fortunately there seems usually to be a connection from point to point by means of more or less defined veins leading from one auriferous portion to another.

The Recruit, Pinafore, Clarence, Land o' Cakes, and Volunteer lines of lode are all large "formations" of the above type. The Chums, Morning Star, New Native Youth, and other smaller and less important lines, are more of the ordinary well known type of fissure lodes, with fairly solid quartz between solid walls of country, but at times they also show a tendency to become large "formations." A good deal seems to depend upon whether the lode is in strong hard country or in more decomposable slate, if it will be a typical lode or a mullocky "formation." The New Golden Point and Crown Company's reef, however, though in hard strong country, appears to be a "formation," the quartz being very erratically disposed in it. It seems most probable that in this

instance a channel of broken sandstone has been filled with quartz in the spaces between the broken blocks. The result is an ore deposit very puzzling and troublesome to follow, but which will very probably assume a different character in depth when the hard sandstone belt is passed through.

The quartz in the Lefroy field usually carries a good deal of pyrites of iron and copper, and often some arsenical pyrites, with the gold, but sulphide of antimony seems especially to be the most favourite associate of the noble metal. It is met with in small quantity in most of the mines. In the old Wanderer mine some fairly large blocks of auriferous stibnite, very pure, were found. This is one of the mines closest to the granite country, and the occurrence of stibnite and gold together here is quite similar to that at Hillgrove, in New South Wales, where also granite intrudes through slates and sandstones near to the mines. The sulphides in the Lefroy field are generally of high gold value when coming from any of the auriferous chutes, but where the quartz is poor in free gold the sulphides are also generally poor, a feature usual in most auriferous reefs.

Examination of any of the mines shows that they are not uniformly goldbearing, but have the ore in patches, bunches, and more or less regular "chutes." The quartz in the chutes is often separated from the barren stuff by a smooth joint, and in such cases the two portions are probably of different age; but frequently, also, there is no distinguishable difference in the stone, except that the gold is present in one case, and absent or in very small amount in the other. Frequently, however, the cause of mining work ceasing in a given direction is the working out of the quartz altogether, broken country and mullock taking its place in the lode-channel. This may be due to faulting subsequent to the formation of the auriferous quartz as above explained, or to the original fissure having been closed or filled with wall-rock at these parts when quartz was being deposited elsewhere. The sections of the Chums, Pinafore, Native Youth, and Volunteer reefs attached to this Report show that numbers of the auriferous chutes have been of considerable length and area. They have not, however, proved themselves as yet equally persistent in depth unfortunately. In every instance as yet the payable gold has ceased at a depth from surface of from 300 to 450 feet, and though gold has been got at 800 and 1100 feet in the New Pinafore, and at 800 feet in the New Native Youth mine, the stone has hitherto been poor. The sections also, however, show very plainly that the amount of work done to prove the lodes in depth is but little, not at all commensurate with that done at higher levels. In the latter the knowledge that gold existed ahead on surface has caused levels often to be boldly extended through long stretches of barren ground, but capital has been wanting to proceed on the same lines in depth. The New Pinafore and Volunteer companies are now making a determined effort to test the matter by extended deep exploration, and, in my opinion, they have great likelihood of ultimate success. The principal cause of the gold giving out in depth seems to be the disruption of the stone by the faulting movements of the walls. The Volunteer No. 2 level from this cause was an almost complete failure for working purposes, hardly any payable stone being found in it, only mullock and lode-slate, with odd fragments of the auriferous reef. Yet, as seen in the longitudinal section, the gold was both below and above it. In this instance it seems clear that the faulting movement tore away a piece of the lode, and the blank space in the bottom of the mine may well be due to a similar accident. In all probability the torn away portions are somewhere in the "formation" yet, for it is difficult to conceive of any method by which they could have been removed from the lode-channel, unless, indeed, the faulting took the form of a movement of the hanging-wall upwards, or reverse fault, which is unlikely. There are so many proofs in these mines of this faulting along the planes of the reefs that it cannot be dismissed as an idle theory, and the obvious consequences of the movements in tearing asunder the first-formed quartz must be expected and looked out for.

But, even if the chutes were, as some of them are, found to become poor in gold without showing any break in their continuity, the experience is by no means an uncommon one in mining. It has happened over and over again in other fields, and in many of these the gold has been found to come in again at lower depths; and I have no doubt that the same will be the experience at Lefroy if deep exploration is patiently and steadily pursued.

The importance of the economic question at stake of the permanency of gold in depth in these lodes will, I trust, be sufficient excuse for a short discussion of certain geological factors affecting the subject which are often unconsidered. If we are to believe that the gold gradually dies out in depth, there must be something in the fact of proximity to the surface favourable to the deposition of gold. Perhaps, it may be said, the gold comes from the surface, say from the sea, whose waters we know contain minute quantities of gold. This is, however, very improbable, for there can be next to no circulation of waters of any sort below sea level in the earth's crust, and certainly none sufficient to make up the large amount of gold in a good auriferous reef from the very small quantity in sea water. Again, auriferous chutes often do not come near the surface in reefs, and have barren quartz over them; if the gold came from above we should expect the outcropping quartz to be all more or less auriferous. The quartz in the Bendigo saddle reefs has no apparent connection with surface at all, yet is often richly auriferous. Another reason often brought forward for a possible deposition of gold near surface rather than elsewhere is the probably greater amount of organic matter, which is an excellent precipitant of gold in the surface rock. There is, nevertheless, organic matter in all sedimentary rocks, no matter how old, and as we know

that gold has been found at a depth of 3000 feet from surface, it does not seem likely that there is any superficial organic matter required for its precipitation. Another pessimistic view is founded on the Ascensional theory of the deposition of lodes, the argument being that in the deepest parts of the fissures the highly heated and compressed water is in the most favourable condition for solution of substances, and that precipitation of minerals takes place when the solutions ascending to near surface become cooled and are under less pressure. Against this we may urge, as before, the Bendigo experience of the gold being found as low down as 3000 feet, as showing that even at that depth precipitation was still possible, and secondly, that the reefs of quartz, pyrites, &c. are in depth going down as strongly as ever, the conditions for the formation of these minerals associated with gold being evidently still favourable. Without very strong experimental evidence that gold is more easily kept in solution than these substances, it is difficult to believe that it would not be deposited with them at lower as at higher levels, the well-known chemical fact being that gold is a metal very difficult to keep in solution and particularly ready to become precipitated. So long as quartz and sulphides are found in the reef fissure so long do we think it likely that gold will be found, supposing it to come from deep down in solution, as the Ascensional theory requires. Another possible explanation of the dying out of gold in depth argues from the theory of formation of lodes by lateral secretion as a basis, pointing out that certain strata are usually more favourable for the occurrence of gold than others, and that if we get the favourable country near surface we shall probably pass through it in depth sooner or later and come into less favourable ground. This line of reasoning has much force, or apparent force, in some instances, but in the case of the Lefroy reefs it happens that it will not hold at all. The country has a certain considerable amount of dip, and in the case of two adjacent reefs like the Chums and Pinafore lines the country carrying gold in the one dips into and forms the supposed unproductive zone in the other. There is no difference in the country at the higher and lower levels in these mines that would account for a general and universal dying out of the gold at the 400 feet level or thereabouts. In discussing this matter with various persons having knowledge of the field, I have often found a rooted belief that the absolute height above sea level affected the question, but the difference in level of surface of, say the Pinafore and Volunteer reef outcrops was taken no account of. Making the opposite side the present of an argument, I would remark that the "critical level," as it has been called, is much more nearly the old sea level of the days when the deep leads were first scooped out than the present one. The absence of oxidation of the sulphides makes it very improbable that height above sea level had anything to do with the deposition of the gold. Also, if height above the sea was the controlling factor, how is it that we find gold-bearing stone and good-looking but barren stone in slabs right alongside one another, not in one instance only, but constantly?

All the above reasoning is on the supposition that at the time of the formation of the gold ore the reefs occupied something like their present position with reference to the surface. But this is really highly unlikely, the probability being that at the time they were formed the portion of the Silurian country now seen at surface was deeply buried under possibly thousands of feet of superincumbent rock. It has been above pointed out that we have reasons for connecting the time of formation of the reefs with the period of the extrusion of the granites of Tasmania, somewhere between the Upper Silurian and Carboniferous periods. Now, granite is a thoroughly crystalline rock, and modern geologists are agreed that it is a rock of deep-seated origin. The same igneous mass which is poured out at surface as a trachyte or rhyolite lava is believed in depth to form granite, the difference in the rocks being simply degree of crystallisation owing to more rapid or very slow cooling. The deep portion, cooling with extreme slowness, becomes the thoroughly crystalline granite, while the rapidly cooled surface lavas are glassy or little crystalline. Before the granite can be exposed there must be enormous superficial denudation. In Tasmania there are several scattered remnants of Upper Silurian rocks, enough, however, to show that the formation was widely spread over the island, and of very considerable thickness. There may also have been deposits of Devonian age. The reefs were in all probability formed about this time. Since then the whole of the Devonian and Upper Silurian strata, and the lavas belonging to the granitic extrusions, have been entirely swept away, and we now have the quartz lodes exposed on much the same horizontal plane as the deep-seated granite. Since the great erosion in Carboniferous times the surface of the Silurian system has been again sunk deep below the sea and covered with the thick sediments of the Permo-Carboniferous and Mesozoic coal measures, and with the doleritic lavas of the great Greenstone formation, and all these have in turn again been eroded. In Miocene or early Pliocene times we know the reefs contained gold, for fragments of them with gold in them are preserved in the gravels of the deep leads. In view of huge geological changes like these, what possible influence can we ascribe to the accidental position of the present surface with regard to the reefs and their auriferous contents? The almost entire absence of any trace of mineral-forming action after the Permo-Carboniferous period in Tasmania shows that we must look to much older geological times for the conditions that affected the deposition of the gold. The conclusion, then, is that we are now dealing with reefs and gold in them that were deposited long ago and deep down in the ground, and whether they were a few thousands of feet deeper or shallower is a matter of no moment. In the Bendigo field there is also granite cropping at surface, yet gold is got at 3000 feet depth. The probability is that the chutes of ore at Lefroy were not very regular in the first instance, and have been much broken by subsequent earth movements, making the occurrence of

the gold patchy. When a patch has cropped out at surface we have worked it, and when it gives out we shall have to go through more or less dead ground in depth just as we have to do along the length of the lodes. But there is no reason to believe that the lodes will cease to be productive at the trivial depths to which they have been worked as yet.

Mining Development.

Proceeding now to describe the various mines in some detail, it will be convenient to take the various lines of reef from the north southwards.

Perpetual No. 1 *Mine, Section* 711-93G.—The reef worked by the Perpetual No. 1 Association was formerly known as Hackett's reef, and was described in Mr. Thureau's report of 29th September, 1882, as follows :—"The *Hackett's* line of reef is situate about 1½ miles north of Lefroy township; it occurs in a soft white to reddish argillaceous slate and sandstone (Upper Silurian), which is besides traversed by numerous veins of white crystalline quartz. A considerable number of small shafts have been put down on its course to various depths, not exceeding, however, 64 feet. The reef so near the surface is narrow, and it underlays to the south. Judging from general indications, the auriferous quartz forms most probably a portion only of other and parallel veins not yet discovered. The gold appears to occur in that characteristically crystalline quartz, without much regularity, but very rich specimens have from time to time been found in this reef. Inducements are held out for prospecting the ground by means of cross-cuts, and the sinking to greater depths, where in the harder strata those veins may consolidate into a more compact body of auriferous quartz." In reference to the above quotation, the present writer has to say that he has not seen any evidence whatever that the country in this mine is of Upper Silurian age; it certainly belongs to the same formation as the remainder of the field. On the general map of the district with this report, three lines of quartz are marked on Section 711-93G. The central one is the Hackett's reef: the one to the south is a small leader carrying a little gold, but too small to be worth working; the northern one is cut where shown on the plan by a number of trenches and small shafts. One of the shafts was put down 40 feet. A shallow cross-cut went from it 150 feet to the north, but got no gold, though a small leader was cut. From this lode south there has been trenching more or less continuously to the south boundary of the section, without finding anything of consequence. The north lode is gold-bearing, but very small. On Hackett's lode some 16 years ago, or thereabouts, a good deal of work was done, and a crushing is said to have yielded 15 or 16 dwts. to the ton; the workings were to the east of the Perpetual Company's main shaft shown on the plan. This has been sunk to a depth of 100 feet. When I visited the workings (25th September, 1896,) the reef had been followed east 74 feet and west 41 feet, and a cross-cut had been driven north 103 feet and south 44 feet. The underlay of the reef is 35 feet in the 100 feet of depth to the south, or say 1 in 3. In the east end it is flatter, about 1 in 1. In the west end the lode had broken up into strings. The quartz vein is quite small, from 2 to 8 inches only, but carried some nice gold. In a cut put into the reef from higher up the shaft, after I visited the mine, good specimens were obtained, showing gold very freely. The north cross-cut was in through pretty solid well stratified country, and was to be continued to cut the north lode. The south cross-cut found very disturbed country, and passed through two leaders carrying gold; the rock was much shattered, and gave out a good deal of water. The opinion formed by me was that the cross-cut had not been driven far enough to cut the true south wall of the lode, and that this would prove to be one of the large "formations" above described. If so, it is probably a much more important line of reef than we should imagine from the small quartz veins found. I should recommend sinking deeper and cross-cutting into unmistakably solid country. The enclosing wall-rocks are soft slates and sandstones of the description considered "kindly" in this field. I understand that an English company have now an option over the property and are developing it, which will give the lode a good trial.

On the plan a line of deep trenching by means of shallow shafts connected by cross-cuts, an excellent method of costeening, is shown crossing the south boundary of Section 711-93G, and another a little further west through the south-eastern part of 732-93G south into 860-87G. No reefs were cut by this trenching. On the north boundary of 860-87G, however, there is a small reef on which several little shafts have been sunk, one of them 50 feet deep; the vein of quartz is very small, and I am not aware of any gold having been found in it. Underlay is southward.

In Section 778-93G a small leader was cut in a pair of prospecting shafts shown on the plan, and a few buckets of very rich quartz were obtained, but the good stone very soon gave out. North of this line runs a longish piece of deep costeening, which did not find any lode of importance.

Looking at all the above leaders and reefs on the map, it will be seen that they appear to converge westerly towards the Recruit lode next to be described, and there is a good deal of probability that they are really connected with it, the reef having divided into branches going eastward. The Perpetual, or Hackett's, reef might very well be the main portion. The line connecting the Recruit and Perpetual workings is therefore very well worth thoroughly prospecting, gold having been found at both ends of it. Very little work appears to have been done along this line.

Recruit Lode, Section 221-93G.—This was in former years worked under the name of the Perseverance reef. Mr. W. H. Stubs, to whom I am much indebted for valuable information as to a great many old workings, has kindly given me the following particulars, under date 7th November, 1896 :—"Perseverance.—Started work some fifteen years ago, and after doing a good deal of surface crosscutting a good sized rubbly lode was discovered, which contained fairly good gold in places. Three shafts were sunk, and the lode intersected—No. 1 shaft, 30 feet; No. 2, 60 feet; and No. 3, 160 feet. Nos. 2 and 3 shafts were connected at 60 feet from surface and the lode driven on 160 feet. In No. 3 shaft the lode was driven upon for a similar distance. From the three shafts a small amount of stoping was done, producing about 150 tons of stone, which was crushed in small lots from time to time and yielded from 4 dwts. up to 16 dwts. per ton. The reef was, however, too patchy to prove remunerative."

The Recruit Company have reopened this old mine by sinking two shafts, a whip shaft 105 feet deep, and a main shaft 310 feet. The lode underlays to the south. The main shaft cut the hanging-wall of the reef at 187 feet, and will be through the foot-wall at 310 feet. When I last saw the mine the shaft was not sunk the full depth given, and preparation was being made to open a level at 303 feet. The Recruit lode is a large soft formation with some very good gold-bearing stone in it, but, as in the other lodes of the same description, this is very likely to suddenly disappear. From the whip-shaft a level was driven at 100 feet, 30 feet east on the lode and 32 feet west, and a little stoping done, which yielded 45 tons of quartz. This gave 43 ozs. 10 dwts. of gold when milled, but included 13 tons of poor second-grade stuff which gave only 1½ ozs. of amalgam, or about 10 dwts. of gold. The No. 2 level is at 190 feet in the main shaft, the lode being cut 36 feet from the shaft. The main hanging-wall, however, is only 16 feet from the shaft. The cross-cut was continued to 61 feet from the shaft into hard foot-wall country. The hanging-wall country is slate and the foot-wall sandstone, both dipping somewhat to the south-west: the lode evidently faults the country strongly. At the time of my visit the drive east on the lode was in 101 feet and that west 77 feet, good gold being got for 20 feet west and 32 feet east from the cross-cut. The quartz was from 8 to 18 inches wide. A little stoping had been done, yielding 30 tons of quartz, which gave a mill return of 15 ozs. 11 dwts. of gold. The pyrites saved from this crushing were thoroughly cleaned by Frue vanners and amounted to 1 ton and 7 cwts., assaying 5 ozs. 18 dwts. gold per ton. The pyrites from the crushing of 45 tons from the whip shaft were badly cleaned, and weighed 2 tons 4 cwts. 1 qr., assaying 3 ozs. 17 dwts. per ton. When I saw this mine its prospects were very promising, but I have not heard how it has developed since. It contains some very good auriferous stone, and will probably yield a large amount if well opened up. The soft mullocky nature of much of the lode, and the liability of the gold-bearing stone to be broken and carried away at any moment by the faulting movements that have taken place, are much against success until the mine has been well opened. The prospects seemed to me to warrant giving the lode a very thorough trial by sinking on it and by doing a lot of driving at various levels.

On surface the reef has been traced by trenches a short distance into Section 233-93G. On Section 484-93G is the West Recruit main shaft, down 100 feet in clean sandy slate. If sunk for the Recruit lode, this shaft will have to go to a very considerable depth before it can hope to strike the reef. On Section 208-93G the East Recruit shaft is down 98 feet: at 94 feet they drove 10 feet north of the shaft and cut the lode, which here underlays south 1 in 4, about one foot wide of slickensided and brecciated stone. There was no gold in the stone, but a little in the rubble and pug. A drive was put in 40 feet to the westward, the lode-matter in the end being 3 feet wide with broken walls. Some pyrites from these workings are reported by the mining manager to have assayed 7 ozs. gold per ton.

The reef is traced by trenches eastward through Section 208-93G, and in Section 482-93G is cut in what appear to be two branches. The southern one is 2 feet 6 inches wide of rubby iron-stained quartz, said to contain a little gold. The northern branch is also said to yield colours of gold in the rubble.

Old Pinafore Mine.—On the north boundary of Section 155-93G is an old shaft said to be 100 feet deep, from which considerable crosscutting north and south is supposed to have been done, but I have been unable to obtain definite particulars. A lot of quartz is lying about the surface of the shaft, which makes it likely that some sort of reef had been cut, but I have been unable to learn anything about its position, size, or value. In the same section near the centre is another shaft which must have been over 50 feet deep, about which also much quartz is lying, but no information is available. It is possible that there is a line of lode between these shafts.

Section 83-93G.—In the south part of this Section a small shaft has been sunk some 40 or 50 feet, in which goldbearing stone was stated to have been discovered, but I did not get any very reliable information about this, and the workings being full of water could not be examined. There is an old shaft to the west of this which is probably on the same little lode.

Chums Line of Lode.—Coming still south we reach the Chums lode, one of the longest and strongest on the field, extending from near the Deep Lead on the east to close to Slaty Creek on

the west. A great deal of work has been done on this lode, and there are several important mines upon it, notably the New East Chum, New Chum, West Chum, West Extended Chum, Boy's, and Unity. A plan and section are attached, also some cross-sections showing the workings of the East Chum, New Chum, and West Chum, so far as any records have been preserved of them; and there is a separate plan and section of the Unity workings. None of these plans, however, are by any means complete, but it was found impossible to get better ones, and they are given, therefore, as the best available. They are compiled from the plans furnished annually to the Inspector of Mines by the mineowners.

In Section 607-93G is the shaft of the New East Chum Extended Co., on a reef on the general Chums line, but which must be a different branch from that worked by the New East Chum Co. This reef is small, but has been cut in some shallow shafts near the main one, and also near the eastern boundary of the section, close to the edge of the basalt of the Deep Lead. I did not see this mine while it was working, and the following particulars are from a report by the late Mining Manager, Mr. Thos. Williams, kindly given to me by Mr. E. Gaunt, Secretary of the Company. The reef was first cut about 4 chains from the western boundary, small, but "very rich in gold." The main shaft was then sunk 150 feet, and the reef cut 20 feet south of the shaft, carrying some gold. Driving east at 40 feet the lode opened to one foot wide, and for 30 feet further, then gave "splendid prospects" both from stone and rubble. The drive was continued for 105 feet through whitish sandstone rock "without meeting settled country," from which expression I infer that the lode broke up into strings. A winze on the good ore having had to be abandoned for water, the shaft was next sunk deeper and a level opened at 200 feet. The reef was cut 24 feet south of the shaft, and a drive put in on it eastward; after driving 40 feet the reef made to 1½ to 2 feet of stone carrying gold; but the water became too heavy for the small pumping plant used, and the company's funds were exhausted, so the mine was shut down. The shoot of gold dipping eastward, it was not expected to be met with at the bottom level till a distance of 130 feet had been driven. Mr. Williams remarks that at the 300 feet level the New Chum Co. drove on their reef for 180 feet with never more than 3 inches of quartz, and then it suddenly widened to 8 feet, going 4 to 5 ounces to the ton.

According to the above showing, which I have had no means of verifying, this mine should be worth going on with.

Section 200–83, *East Chum.*—The general plan shows three branches of the main lode,—the main one at the main shaft, one to the south known as Williams' lode, and one to the north, which is likely to be connected with the East Chum Extended lode. Gold has been got in all three branches, but the north one appears to be of little consequence. The shaft on it was full of water when I saw it, so no examination was possible. The workings from the main shaft are shown on the plans and sections, so it will be useless to describe them in detail. There are several branches of the lode, and everything at this east end of the line appears to me to show a tendency of the reef to split up and die out going eastward. In the New East Chum workings, however, the main branch is still a strong body of good-looking quartz, but very little gold has been got outside the old stopes shown on the longitudinal section. The main shaft is 413 feet deep, and the lowest level 406 feet. The country is slate and sandstone, striking north-westerly, and dipping to the south-west 15° to 30°. Some of the stopes of the East Chum mine near the western boundary underlay north, while the adjacent New Chum reef has a southerly underlay, the reef being split and the gold on different branches. A good cross-cut both north and south on the boundary between these properties seems likely to give very useful information. The East Chum mine has been unfortunate in not having ever had much capital for working purposes, and prospecting work in it has gone on slowly. It seems well worth spending some more money upon.

At the time of Mr. Thureau's report in 1882, the East New Chum Company were on gold at the 240 feet level, and in the subsequent report of 1883 he gives the yield of gold from it up to date as 331 ozs. 5 dwts. I have not been able to obtain the total tonnage crushed from this mine, or the total gold raised, but understand that it has never paid a dividend.

The Chums Proprietary Mine.—In this are now included the New Chum mine, Section 366, the West Chum mine, Section 368, The West Extended Chums mine, Section 411, and Sections 546–93G and 547–93G, on which are the workings of the Old Boy's mine and the more recent West Extended Pinafore Company, the latter, however, being on the Pinafore line of reef. The plans and sections show the work done better than can be described in words, but I have been quite unable to procure plans of the West Extended Chum and Boy's workings, or to get any information about them worth mentioning. The New Chum mine has been shut down for many years, and only very little of it can now be inspected. As shown by the section, there was a fine chute of ore in this mine. The total value of the gold got by the first Company was £108,036, and of this £58,250 was paid in dividends. The total yield is given by Mr. Thureau as 25,675 ozs. 1 dwt. 20 grs. at the date of his report. The mine was opened from the first out of the gold obtained, without making calls on shareholders. When the bottom level proved unpayable work was suspended, there having been no reserve fund set aside for prospecting work in times of adversity. The levels

from the West Chum shaft are now being pushed forward under the New Chum workings in the hope of getting the downward continuation of the chute, but as yet little success has been met with.

The present Chums Company's main shaft is that first sunk by the West New Chum G. M. Company. For many years past the bottom level has been under water, and work confined to extending the upper levels, but since the days of the West New Chum Company the concern has been unpayable. The first gold was got at a depth of 62 feet from surface, the reef being from one to three feet wide, and a crushing of 41 tons gave 6 oz. 13 dwts. of gold to the ton. In 1883 Mr. Thureau gives the total yield as 13,939 ozs. 4 dwts., and the dividends as £21,000. The expenditure on the mine before dividends were paid is stated to have been £2250, after which all expenses were paid ont of the gold raised. After the mine became unpayable parts of it were worked by tributors, and some work was also done by the Chums G. M. Company before the mine passed into the hands of the present Chums Proprietary Company. I have not been able to obtain returns of the gold got during this period. Writing on the 23rd October, 1896, Mr. J. B. Hickson, secretary of the present company, gives the gold got by them up to that date as 321 oz. 1 dwt., of value £1185 13*s*., from 1509 tons crushed, but this company has practically only been prospecting. 9 tons 3 cwts. of pyrites have also been sold, of value £38 2*s*. 10*d*., or £4 3*s*. 1*d*. per ton. In 1890 a sample of clean pyrites washed by myself from the tailings heap at the West Chum battery yielded on assay by the Government Analyst 4 oz. 5 dwt. 17 grs. of gold per ton.

The longitudinal section shows that there have been several chutes of ore worth stoping in the West Chum mine, and that there has really been very little done to search for their downward continuations. The reef is generally hard quartz, often laminated, and carrying a good deal of pyrites and stibnite. It is in many places divided into two or more approximately parallel branches, requiring therefore frequent cross-cutting. In some parts of the mine one of these branches has been followed and proved valueless, and then later it has been discovered that there was rich ore in an adjacent parallel vein. In the west end of the mine the reef appears to be splitting up still more, the branch worked by the West Chum Company being apparently a separate one from that on which the West Extended Company did their stoping.

Taking the whole longitudinal section of the East Chum, New Chum, and West Chum workings, as shown on the drawing herewith, it is seen that there has been a large amount of payable ground in the reef for a long distance on its course. That such bodies of ore should be the whole quantity existing in the lodes is a supposition quite contrary to general mining experience, and I have no doubt that if operations at deeper levels are perseveringly carried on other similar rich patches will be laid open. The working of these mines in depth is, in my opinion, a very genuine mining enterprise.

The West Extended Chum mine, Section 411, has long been closed, and I have not been able to get any information as to the extent of the workings or the tonnage and value of the ore milled. Shaft 189 feet deep at date of Mr. Thureau's Report.

Section 546-93G.—The shaft shown on the general plan in the north of this Section is believed to be one belonging to the old South West Chum Company, but I have no information at all about it further than that contained in Mr. Thureau's 1882 Report, viz.—"Shaft had reached a depth of 200 feet, and machinery would be requisite to overcome the influx of water."

Section 547-93G.—Two shafts in the north of this Section were formerly known as "Our Boys" shafts; they have been abandoned for many years. Mr. Thureau says of them.—"The Great West Extended New Chum Company ('Boys') have sunk two shafts. Of these two their old shaft was 260 feet deep, and they had opened at the 250 feet level. Their new whim shaft had reached a total depth of 140 feet, but at that level they had so far failed to intersect the continuation of the gold-bearing stone which was found at the 100 feet level in the old shaft, though they had driven along the reef for a distance exceeding 100 feet in length. The gold-bearing stone measured from 6 to 8 feet in width."

Unity Mine, formerly *United Chum*, Section 748-93G.—The two shafts seen on the plan in the south-east part of this Section belong to this mine, a plan and section of the workings of which are also appended hereto. The eastern shaft is a whim shaft from which considerable stoping was done and a good deal of gold was got out; the western shaft is the one from which all operations have been carried on in later years. After doing a good deal of work at the lower levels without any good result, a cross-cut was put in to the south to cut the Pinafore lode, but this also proved disappointing. Mr. Thureau in 1883 gave the return of gold from this mine as 1342 ozs. 1 dwt., but I have not ascertained how much has been got since. Owing to changes of ownership and want of care in preserving old records, it is often very difficult to get any information as to old mines.

Section 761-93G.—Towards the north-east of this ground is the old shaft of the Ryhope Gold Mining Company, long since abandoned. In 1882 Mr. Thureau says that the Company were sinking below the 180 feet level, but does not mention if any lode had been cut. I have never heard of any discovery of value having been made from this shaft.

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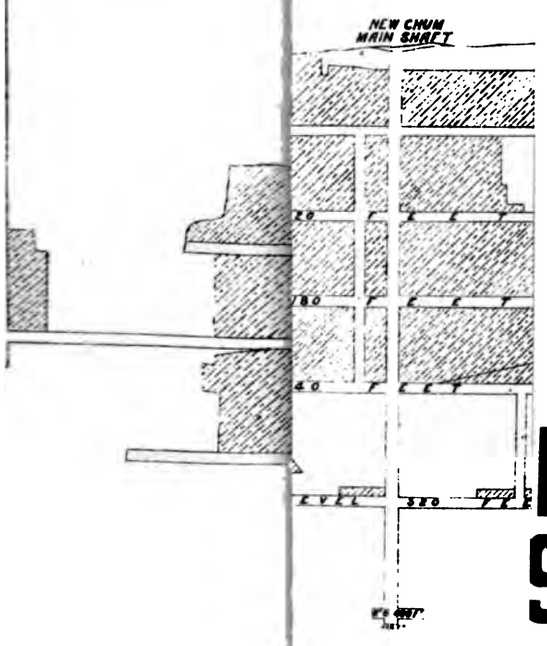
ENDED CHUM SHAFT

TUDINAL SECT

OUT SHOWN BY SHADING THUS



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Section 762-93G.—The shaft in the south-eastern angle of this property was sunk by the Band of Hope Company, but has long been full of water. In 1882 Mr. Thureau mentions that sinking was in progress below the 150 feet level, but I have no later information as to the total depth reached, or if the reef was cut.

Section 789-93G.—There is an old deep shaft near the centre of this section, sunk by the long defunct United Chum Extended Company. In 1882 Mr. Thureau reports sinking in progress at a depth of 118 feet; I have not been able to learn that a reef was cut.

About 700 feet west of the last-mentioned shaft is another, sunk by the Consolidated New Chum Company on land not at present under lease. In 1882 sinking was going on below the 140 feet level. I have not heard of the reef having been found, and work has ceased for many years.

From the Unity main shaft westward it is doubtful if the Chums lode has been cut at all, though, as shown on the general plan, the above four main shafts have been sunk on about the line of it, and presumably some discovery had been made in each case to justify sinking. There are no more workings on the line of the lode for some distance further westward until we reach Sections 1118, 1127, and 1128, where a reef has been found corresponding in course and position with the Chums lode and therefore probably identical with it. None of these workings are extensive, and I have not learned that any gold of consequence has been discovered. The shaft in Section 1118 was sunk by the Telephone Company, and that in 1128 by the Outward Bound Company. From the quartz about these shafts they seem to have had a strong reef.

The New Pinafore Line of Reef.—Towards the end of 1890, in prospecting and working alluvial gold to the south of the Chum line of reef another lode was discovered, which has proved very important. It is a parallel reef to the Chums line, and only some 300 to 350 feet distant from it, and has received the name of the New Pinafore lode. Unlike the hard Chums lode, this one is a wide soft reef as a rule, consisting of several veins of quartz in a wide "reef formation" of mullock and lode slate. As above mentioned, the auriferous quartz is usually much crushed and fractured and mixed with mullock from faulting movements along the plane of the reef after the quartz had been deposited. In the New Pinafore mine three distinct veins of stone are seen in the lower levels, though at surface they were all together as one body of quartz, known as the hanging-wall, foot-wall, and intermediate lodes. As shown by the cross-sections these diverge in depth, and appear to form three separate parallel lodes. In the 800 feet level the foot-wall lode is a strong body of quartz of likely appearance carrying a little gold, but not payable. The intermediate lode appears to be the one on which the faulting movements have principally taken place, for even down to the 1100 feet level it is a wide "formation" consisting of a solid vein of quartz on the foot-wall with 8 or more feet of lode-slate squeezed and broken country and hard pug on the hanging-wall. In the deep winze from the 800 feet level the upper side of the quartz vein on the foot-wall is often highly polished or slickensided. At this level the hanging-wall lode has not yet been cut, owing to its flat angle of dip.

A plan, longitudinal section, and some cross sections of the workings on the Pinafore reef, are appended to this Report. The plan shows the complexity of the workings arising from the branching of the lode into the three veins just mentioned, it having been necessary to keep driving more or less on all three branches and cross-cutting continually from one to another. The longitudinal section is not so satisfactory as it should be, for the stoping shown is sometimes on one branch of the lode, sometimes on another. For correctness there should be longitudinal sections of each branch lode. Circumstances already explained have, however, prevented me from having time to rectify this.

East Pinafore Mine, Section 392-87G.—The main shaft of the East Pinafore Company is near the centre of the section quoted. As above stated, the first 236 feet in depth of the shaft were through basalt and Tertiary deposits belonging to the deep lead. The longitudinal sections shows how the outcrop of the reef dips deep under the Tertiary covering going eastward. The drawings show some small workings that were put in to work the alluvial "wash," but the flow of water from this was so great that it was considered imprudent to jeopardise the workings on the reef by trying further after the gravel. The lower levels shown on the plans were put in to work the New Pinafore reef, which was duly found and followed, but with poor success, only a little gold-bearing stone being discovered. The lode is very mullocky, and often full of crushed quartz mixed with squeezed and twisted country rock. After a long struggle the mine was shut down in 1896. It deserves further trial both in the alluvial ground and along the reef, and will no doubt again be opened in the future. I have no record of the yield of gold from this mine, but know that it was quite small.

New Pinafore Mine.—In the upper levels, as shown on the plans, there was a large amount of good auriferous ground, which has been stoped out. When the mine became poor in the bottom it was decided to try again at a considerably deeper level, and the central shaft was sunk to 800 feet, where a cross-cut was driven to intersect the reef. Before cutting the foot-wall stone several small leaders were met with, some of which carried gold. Driving west on this lode there was a body of

much brecciated stone three to four feet wide, nice-looking, but carrying no gold. In the east drive on it there was a little gold at times, and some of the pyrites got by washing the powdered quartz gave gold equal to 1oz. 13dwt. per ton. Between this foot-wall lode and the intermediate lode there was hard strong country, showing little evidence of disturbance. Driving west on this lode it was found to be a wide mass of mullocky matter containing a little gold, not payable, at two or three places. The crosscut has been carried some distance (see plans) past the intermediate lode, but is not yet far enough forward to cut the hanging-wall stone if this continues at the same underlay as in the levels above. To try the intermediate lode at lower depths a winze or underlay shaft was next carried down to a depth of over 1100 feet from surface. A little gold was got at times, but not payable. At the time of my visit sinking this winze was in progress, and, I understand, that it has since been continued deeper and some driving has been done from it. Gold has been got in small quantity down to the deepest level, and in my opinion there is every inducement to keep on working pluckily, as there is sure to be more gold to be found.

Up to 22nd October, 1896, the New Pinafore mine had crushed 46,032 tons of stone for a return of 42,212 ozs. 9 dwts. 15 grs. of gold, worth £168,840. Of the total quantity 585 ozs. 10 dwts. 6 grains came from the chlorination works attached to the Company's battery. This is a good mill, though of a somewhat old type, and has lately been improved by the addition of better concentrating plant. The concentrates are roasted in a long reverberatory furnace, and then chlorinated. I understand that cyanide treatment is now also being resorted to.

The West Pinafore Mine.—This property adjoins the New Pinafore, and the workings are connected as shown on the plans. Up to 22nd October, 1896, the mill returns were 6709 tons of ore crushed, for a yield of 4551 ozs. 2 dwts. of gold, valued at £18,200. This Company also has a fair battery.

The West Pinafore Extended Mine.—The Pinafore reef was cut in this, as shown on the plan, and proved to be a wide, broken, mullocky "formation," with little, if any, gold. Work was soon suspended, and the lease has since passed into the hands of the Chums Proprietary Company.

Unity Mine.—As already mentioned, the Pinafore reef was cut in the Unity mine, but was valueless.

Young Chums Mine.—Near the south-east corner of Section 789-93G a small shaft has been sunk to work a "formation" which seems to be the Pinafore lode. At the time of my visit, the cross-cut from the shaft was not completed, and all that was to be seen was a very doubtful-looking vein of rubbly quartz in a trench on surface. The shaft was 65 feet deep, and the cross-cut for the reef opened at 61 feet.

The Pinafore line of reef has an excellent record, and will, doubtless, yet prove a large producer of gold if energetically opened up at deep levels.

Golden Era Line of Lode.—This is the next line known south of the New Pinafore reef, and is shown on the plan in Sections 821-87G and 373-87G. The most easterly shaft on the plan is an old one sunk by the East Golden Era Company, and is said to be over 200 feet deep, but I have not been able to procure particulars of the work done from it. The next shaft west of this was also sunk by the same old Company. It is stated to be 206 feet deep, and at the 200 feet level there was cross-cutting done for about 70 feet to the south and about 80 feet to the north. A soft lode "formation" six feet wide was cut in the drive south, and Higgs' leader in the north one. North-west from this shaft the plan shows a smaller one, known as Higgs' shaft, from which some good stone was obtained. This was from Higgs' leader, which appears to be a branch of the main lode, or a vein parallel to it. The shaft was 100 feet deep, and the gold came from stopes between the 40 feet and 70 feet levels, 29 tons yielding 97 ounces of gold. The reef was about one foot in width, but not a solid body of stone. It had an underlay to the south.

Coming still west we find an old shaft, now fallen in, almost on the boundary between Sections 821-87G and 373-87G. This was 170 feet deep, and is referred to above in dealing with the alluvial deposits, in a quotation from Mr. Thureau's 1882 Report. The total length of the cross-cut at the 170 feet level was 530 feet; course north-east. I have no information as to workings on the lode from this shaft. West of it there are several small prospecting shafts which do not appear to have been of importance. South-west from the old shaft we see on the plan the main shaft of the present owners of the ground, the Amalgamated Golden Era G. M. Co. This was shut down when I visited it, and the following particulars are from reports kindly furnished to me by Mr. Edward Gaunt, Secretary of the Company. Mr. N. Foote in a report dated 15th July, 1896, gives the depth of the shaft as 250 feet, and says that at 240 feet a cross-cut was driven north 93 feet. At 16 feet from the shaft a small unimportant leader was cut; at 67 feet another with a northerly underlay and course N. 10° E.; the latter was followed 30 feet eastward and 10 feet westward; it was small, but carried some gold. At 93 feet the hanging-wall of the main lode was cut by the cross-cut, and drives were put in 80 feet to the east and 15 feet to the west, the lode being at first 2 feet 6 inches wide, but varying in size as it was followed. Driving east "some very rich

stone was obtained" at about 60 feet, the reef being 18 inches wide; the stone went down below the floor, but did not rise to the back of the level. A little gold is also reported in the west end. Difficulties with water and want of capital caused the mine to be shut down.

Two shafts marked on the plan near the centre of Section 373-87G, on the crown of the ridge, are old workings of the Chance mine. From these it is supposed that there were cross-cuts to the reef, but very little information could be obtained about them.

On Section 119-93G a small leader has been cut corresponding very well in position with the Golden Era reef, but very little work has been done to prove it, the vein being so small.

The Golden Era lode, though not a large one, appears to have contained some good auriferous stone, and probably will be again and again tried as interest in the Lefroy field revives.

Clarence Line of Lode.—In Sections 385-93G and 993-87G three lines of quartz are shown upon the plan of the field. The most northerly one, near the north-west angle of 993-87G, is an unimportant vein of quartz which has been cut in some shallow trenches, but not mined upon. The next one is known as the Clarence North lode, and the one south of it as the Clarence South lode. Both have been worked in the Clarence mine, and the south one is also seen in the East Clarence, Section 383-93G. The New Golden Heart Company are also cross-cutting for it in Section 573-93G. The Clarence main shaft is a small one, 7 feet by 3 feet 6 inches, only fit for prospecting; it is 209 feet deep, and levels have been opened at 80 feet and at 194 feet. At the latter depth a cross-cut has been driven S.S.E. a distance of 177 feet through slate and sandstone country dipping south-westerly. At 45 feet from the shaft the north lode was met with, and has been driven on to the eastward 284 feet. The lode-matter is soft mullock mostly, with a little crushed quartz through it, between smooth walls. The country is distinctly faulted by the lode. For 60 or 70 feet in the east end of the drive some gold-bearing stone was obtained and a little stoping was done, the quartz being apparently a patch of the original lode-filling which has escaped destruction by the later faulting movements. It was much shattered and crushed. In the cross-cut the country for 16 feet to the north of the lode is shattered, and has an abnormally steep dip, about 65° to the S.W., and it is probable that the reef channel is really to be considered much wider than the space actually between visible definite walls; in the upper level it is very evident that there is a wide "formation" outside the more defined lode fissure. About 15 feet to the end of the cross-cut a little drive has been put in to the east on a sort of break in the country, which appears to be the only sign of the south reef, unless, indeed, it underlays very flatly and is still further south. In the 80 feet level, however, a similar "track" was found, and it seems probable that this really represents the south reef at this point, if north and south reefs are not really one and the same as seen hereafter.

In the 80 feet level the north lode is 23 feet from the shaft, and had been followed, at the time of my last visit, 256 feet to the eastward, showing well defined smooth walls, and a "formation" about four feet wide of pug and shattered country with intermixed fragments of quartz. For the last 63 feet, corresponding very well with the ore stoped from the lower level, there was a little gold in the quartz when it appeared, but only odd stones of it and a little crushed stuff were obtainable. A cross-cut north, 48 feet from the face, showed the footwall not to be the true wall of the lode-channel, as there was another wall eleven feet further in, the space between the two being full of twisted disturbed country, and at the time I saw it, though the cross-cut was in 25 feet it was not certain that the undisturbed country had been reached.

The north lode was passed through in the shaft between 113 to 125 feet, from 3 feet to 3 feet 6 inches in width; it contained no free gold, but gave a quantity of pyrites, which were reported to assay 12 ozs. 15 dwts. 4 grs., and in another instance 22 ozs. 8 dwts. of gold to the ton.

On surface the north lode has been traced by trenches westward into Section 580–93G, and eastward to near the crown of the ridge running through Section 993–87G. Further east several shafts have been sunk and trenches dug to find it, but without further success than that two leaders, underlaying north, *i.e.*, the opposite way to the reef, were cut in two little shafts just inside the boundary of the adjoining Section 385–93G.

The south reef, on the other hand, seems to die out suddenly going westward, just as the north one does going eastward. It was worked on surface many years ago on the ridge where shown on the plan, but could not be found in three shafts immediately to the west. It has been traced eastward on surface to the edge of the Tertiary basalt, to the east of the East Clarence shaft. In the East Clarence mine the lode is quite similar to the north lode of the Clarence in the lower levels, and I strongly suspect that they are identical, and that the west part of the reef has been heaved north by a fault. This would explain the sudden cutting off of the north lode to the eastward and of the south lode to the westward, and would explain why the Clarence mine has never got the south reef in the cross-cuts. It is quite possible that there is not a true fault cutting fairly across the lode, but that the wide channel of shattered country along the line of this has a fissure across it from wall to wall, and that the lode has formed on opposite sides of the main channel on each side of this heave. It seems more probable that the dislocation of the reef is due to a local heave of this sort than to a true fault, for one of the latter of magnitude sufficient to produce so much lateral displacement of the lode could hardly have missed being seen in some of the adjoining mines. Driving eastward on the Clarence north lode should soon solve the problem.

The Clarence mine has not been a producer of much gold, but has yielded sufficient to show that it is well worth prospecting further, especially at greater depth. A new shaft further south than the existing one, and much better equipped with machinery, is urgently required in order to open satisfactorily in depth.

East Clarence Mine, Section 385-93G.—The main shaft of the East Clarence Company is shown on the general plan of the field about three chains from the south boundary of the section. It was sunk as a prospecting shaft, 6 feet by 3 feet, but below the 160 feet level has been lengthened to 9 feet by 3 feet. The shaft is 230 feet deep, and at the time of my last visit preparations were being made to open No. 3 level at 220 feet. No. 1 level is 100 feet from surface, and No. 2 is 160 feet. At No. 1 level the lode was cut 43 feet from the shaft and to the north of it, and followed westward 55 feet and eastward 94 feet. The lode proper is a vein up to three feet wide in a much wider broken "formation." In the main cross-cut a hard footwall is seen eight feet past the lode. Going east gold was found in the floor of the level abont 14 feet from the cross-cut and at 30 feet in; stopes are seen in the back of the drive. The vein-filling is mullocky material containing much shattered and crushed quartz in the auriferous portions. The underlay is to the south.

At the 160 feet level the lode was cut 22 feet north of the shaft, and followed on to the east 240 feet, and westward 143 feet. In this level the chute of gold was west of the shaft, dipping apparently westward, therefore at a flat angle.

Some good crushings have been taken from this mine, but I have not the exact figures of the tonnage and yield. The stone is quite similar to that of the New Pinafore mine, and the whole Clarence reef closely resembles the New Pinafore one, but appears to be smaller. The Clarence lode is one of the wide shattered lode-channels or "formations" that have been above described, and affords excellent examples of the crushing of the auriferous stone by the pressure and movement of the walls. It is well worth an extended trial in depth.

New Golden Heart Mine, Section 573-93G.—Three shafts are shown on the general plan towards the south-west corner of this section. The furthest north one was not very deep; it passed through the edge of the basalt and struck slate bottom. The next one to the south is 58 feet deep, but did not penetrate through the basalt. The furthest south is the main shaft of the New Golden Heart Company, sunk to prospect for the East Clarence lode. As shown by the plan it is well situated for cutting this lode in depth, but is rather far south to get it at shallow levels without some cross-cutting. It seems to be near the middle of a branch of basalt from the Deep Lead, but the gutter is probably some chains east of it. The shaft is 220 feet deep, and a cross-cut is driven northward from it at the 200 feet level. In sinking through the Tertiary material the following section was obtained:—

	ft.	in.	Total. ft.	in.
Basaltic clay	30	0	30	0
Strong basalt	41	6	71	6
White silt	8	0	79	6
Dark soil	1	6	81	0
Sandy clay	10	0	91	0
Waterworn wash	10	0	101	0
Slate and sandstone	119	0	220	0

The Manager of the mine, Mr. Tripptree, informs me that he got traces of gold from the gravel on the bottom, which latter was dipping about 1 in 3 to the east. At the time of my visit the cross-cut had been driven north 67 feet through slate and sandstone country with little dip in any direction, and containing numerous small nearly vertical veins of quartz from ⅛-inch to 2 inches wide running more or less east and west. At 13 feet from the shaft a small lode was cut of 6 to 8 inches of quartz running N. 87° W. and dipping south 68°. At 44 feet from the shaft another little lode of 6 to 8 inches of quartz was met with running N. 85° E. and underlaying very slightly to the north; this seemed to be cut in the centre of the cross-cut by a slide running N. 40° W. and underlaying 2 in 3 to the S.W. A little gold was got in this lode, and after leaving the district I have been informed that some fairly good stone was obtained. The East Clarence lode, however, had not been cut when last I heard of the mine. The cross-cut is well worth pushing on.

Morning Star Line of Lode.—This is a strong line of reef, on which a great deal of prospecting and some good mining work have been done. As seen by the plan of the field, it seems to extend as far east as Section 275-93G, but appears to get small and become split up at this end. It is the only one of the Lefroy reefs that seems to be at all certainly traceable across the Deep Lead; the Volunteer reef, being quite south of the alluvial ground, not being referred to in saying this. The Welcome workings on Section 172-93G are so exactly on the line of the lode seen west of the deep ground that there can be little doubt that they are on the same lode. The Morning Star reef is a strong body of stone, resembling the usual type of quartz reefs elsewhere rather than the broken "formations" so common at Lefroy. Gold has been got in it in several places, but except in the Morning Star mine itself there has been little ore worth crushing. This mine after standing idle for many years was unwatered in 1896, but little more was done than looking at the old workings

when circumstances again compelled suspension of work. I was not able to see the mine during the short period it was open, and in fact have not been able to get underground in any of the shafts along the line. The following information is gathered from various sources :—

Section 275-93G.—On this section as shown on the plan a reef has been cut by a number of trenches, and just east of the eastern boundary is a shaft about 100 feet deep sunk by the Million P.A. A reef has been cut in this shaft, but I am unable to say whether it was got in sinking or by cross-cutting north or south, nor have I any information as to the size or value of the quartz.

A little north of Section 933-93G are several old prospecting shafts as shown on the plan, in which a reef has been cut. It seems likely to be a rubbly reef, with much mullocky matter with the quartz judging by the stuff thrown out of the shafts. All the old holes are full of water and much fallen in, so the size of the reef cannot be estimated. This lode is to the north of the Welcome and Million line, and is probably a branch from it.

Welcome Mine, Section 172-93G.—A reef has been traced by trenches and shallow shafts right through this section, disappearing westward under Tertiary alluvial matter of the Deep Lead. The New Welcome G. M. Company have sunk a main shaft shown on the plan, near the centre of the section, and east of it there is a whip shaft 50 feet deep, 8 feet north of which the lode was cut. The main shaft was sunk 186 feet, and a cross-cut driven 34 feet to the north. The lode was met with at about 20 feet, and was driven upon to the eastward 28 feet, the face showing 3 feet in the width of rubbly quartz and grit with no gold in it, when work was stopped in June, 1895. Another level had previously been put in at 100 feet from surface, the reef being cut 50 feet north from the shaft ; it was here 4 feet in width of rubbly quartz with a little gold in it, but not payable. The water became too heavy for the small engine used, and better machinery would be required before the mine could be re-opened. There is gold-bearing stone in this mine and a fair-sized reef, so it offers some inducement for further trial. Some of the stone is very splendidly slickensided. The workings from the whip shaft are said to be connected with those from the 100 feet level of the main shaft, but I have not learned that any stone was milled.

Section 583-93G.—In the north part of this lease there is an old shaft probably quite 50 feet deep, but there is no quartz about it to show that the reef was cut, and it seems to lie south of the line.

Section 310-93G.—Near the north boundary of this the Morning Star reef was cut in an old fairly deep shaft now fallen in, shown on the plan, and from this point it has been traced westward to Section 551-93G. In an old deep shaft (fallen in) just west of Section 310-93G the reef must have been a large body of quartz according to the stone at surface and local reports. South of this there has been a little alluvial digging on the edge of a branch of the Deep Lead. Three and a half chains further west is another old deep shaft, in which the reef is said to have been a soft "formation," and about four and a half chains still further west is yet another in which there was a strong body of quartz. In Section 848-87G two more shafts are shown on the plan, both fairly deep, and both apparently having yielded much quartz. In Section 863-87G on the east side of the road we come to the East Morning Star whip shaft, from which a good deal of work appears to have been done. Between this and the Morning Star main shaft, which is close to the west boundary of Section 863-87G, are two more small shafts and some trenching, and by the same means the reef has been traced westwards into Section 551-93G, where there are two fairly deep prospecting shafts belonging to the old West Morning Star mine. In the eastern one of these the lode is reported to have been twelve inches wide. Still further west in Section 746-87G we see the Bendigo or Reliance workings, which appear to be on a branch of the Morning Star line.

Morning Star Mine.—A plan and section of the workings of this mine, copied from drawings in the Inspector of Mines' Office, is attached to this Report. When the mine was pumped out by the Amalgamated Morning Star G. M. Co., No Liability, in August, 1896, the Mining Manager reports getting gold-bearing stone from the winze in the east level at 200 feet, the stone being 4 feet wide. The most complete account of the old workings that I have been able to obtain is given in a report by Mr. W. H. Stubs, from which the following particulars are taken :—From surface to the 70 feet level several crushings yielded from 4 dwts. to 17 dwts. gold per ton, the reef being from 2 to 10 feet wide. The No. 1 level, at 150 feet, was driven about 100 feet east, and the ground stoped up to the 70 feet level, the stone crushed being payable. The No. 2 level (230 feet), was driven 210 feet, the reef being 2 to 4 feet wide, of similar quality to that above. The No. 3 level (320 feet) was driven 100 feet east, the reef being 3 feet wide, and rather poor. Driving west a good improvement took place, and the first crushing gave 12 dwts. to the ton. This level was driven some 300 feet, of which the first 200 feet were on payable ore ; and in stoping up from this level some good stone was met with. One crushing of 400 tons yielded a little over 400 ozs. of gold. Large quantities of stone were crushed from this portion of the mine with highly remunerative results. The No. 4 level (420 feet) was next opened, and the reef driven along westward for 250 feet, about 3 feet wide, but not payable, "except some excellent stone met with near floor of

level." The mine was then let on tribute, but the tributors were unable to keep going, and the workings were allowed to fill with water, and the machinery was sold off. The water was easily kept under by a 7-inch plunger.

From Mr. Stubs' account of the mine and the plans preserved it seems that there was a rich good chute of ore in this mine, and that working was abandoned owing to financial embarrassment rather than on account of the mine having failed. It seems well worth trying at lower levels, below the old workings.

Bendigo Mine, Section 746-87G.—All that is now visible on this mine gives no information further than as to the general course of the reef, which is as shown on the plan. There are several old fallen-in shafts, some old shallow alluvial digging below the line of the reef, and a main shaft full of water. I am indebted again to Mr. W. H. Stubs for particulars, as follows:—Under date 7th November, 1896, he writes: "New Bendigo, late Young Bendigo, late Reliance.—As far back as nearly twenty years ago the Reliance Company worked this property, but owing to the extremely patchy nature and diminutive size of the reef they did not remain long in existence. In 1885 Stubs and Keys took up the then abandoned section, and after prospecting some little time a small rich vein or leader was met with and sunk upon for a distance of 40 feet, during which the vein varied in size from one inch to twelve inches in width. At the 40 feet level, and in the course of driving, the vein widened out in one place for a distance of about 30 feet in length to 3 feet and 4 feet, and carried good gold at times, but did not maintain its size either above or below the level, which was subsequently proved by sinking another shaft 70 feet in depth and rising and connecting with the 40 feet level. The 70 feet level virtually proved a failure, for, although we drove along the course of the lode for over 200 feet, nothing approaching payable was met with. Small crushings, from 1½ to 40 tons, were put through the mill and produced about 300 ounces of gold, the amount of stone raised for this being between 200 and 250 tons. Some rich patches were discovered occasionally. One miner's cap full was taken off the wall at about 30 feet from surface, and after being panned off and cleaned yielded 21 dwt. of melted gold. Another time we crushed 1½ tons for 12 oz. 16 dwt., but on the whole the reef was too small and patchy to be of any use to us. We sank another shaft 100 feet immediately south of where we had the best gold, and put in drives east and west to overlap the upper level, but these workings were valueless, and the mine was closed down until another company was formed and sank the 100 feet shaft a further depth of 70 feet, cut the reef and thoroughly prospected it; but it, too, proved of no value. The New Bendigo then sprang into existence and started operations in the same shaft by sinking it a further depth of 60 feet. The reef was again cut at 230 feet from surface and driven on 60 feet west and 65 feet east; here the reef, or vein rather, was extremely small and of no value whatever. The country also was very hard and expensive for working. Mine at present shut down."

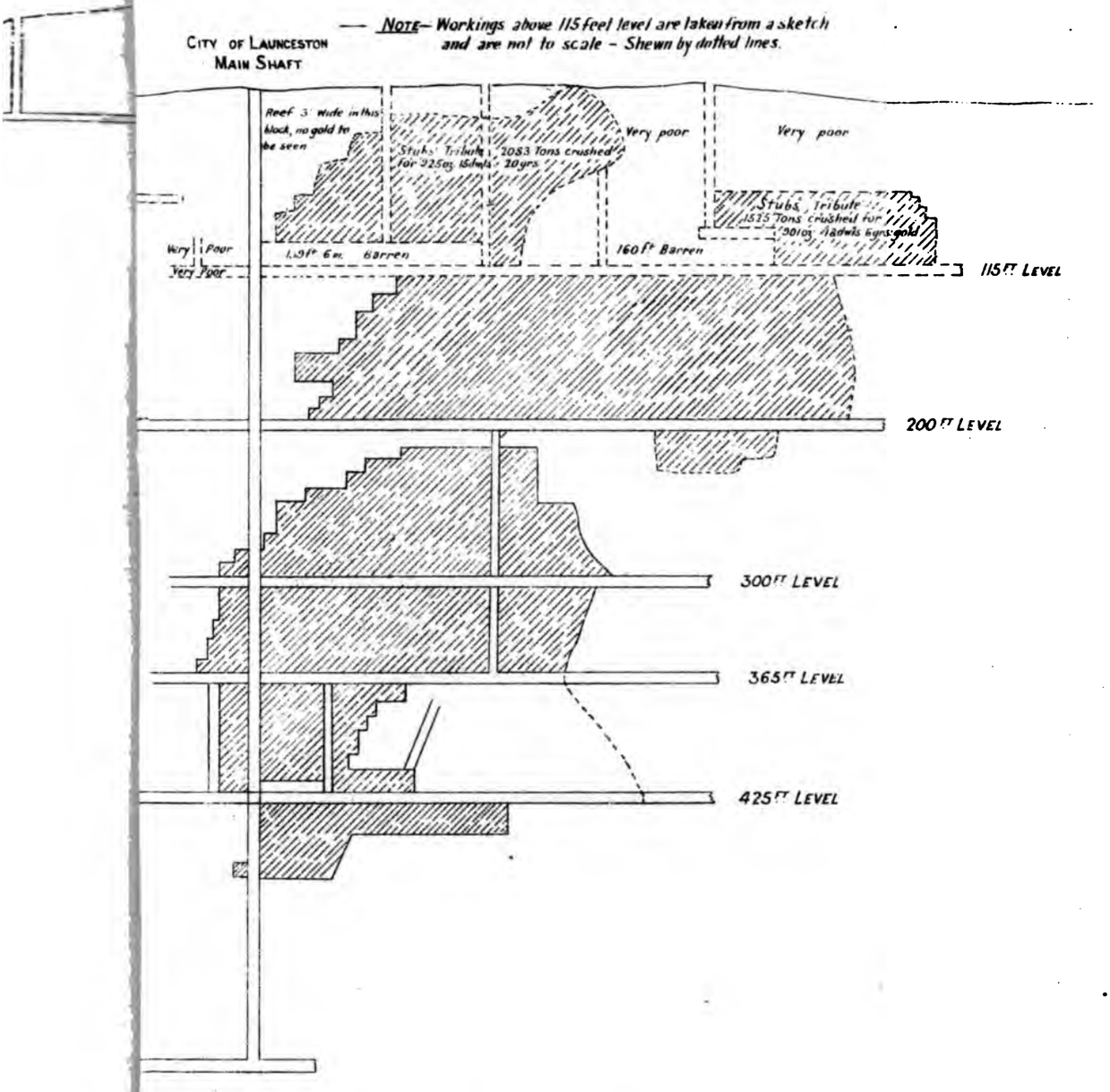
New Native Youth Line of Reef.—Sections 161-83, 133-83, 495-87G, and 113-93G. No work has been done on this reef for some years past, and the shafts are full of water. The shaft in Section 161-83 is known as the City of Launceston shaft, that in 133-83 as the New Native Youth shaft, and the largest one in 495-87G, as the Excelsior shaft. An old shaft in Section 263-93G further west is that of the West Native Youth Mine, but I am informed that the reef was not cut in it at all.

Mr. Thureau, in his Report of 1882, gives a plan and Section and some cross Sections of the New Native Youth lode, and a more complete drawing is appended to the present Report. It has been a strong well defined reef, underlaying to the north instead of to the south like most of the Lefroy reefs. If this underlay is maintained in depth this reef must ultimately meet the Morning Star lode, and there is great hope that the junction will prove auriferous. A deep shaft to find this junction has long been a favourite scheme of Lefroy miners, and a very reasonable venture it appears.

The Native Youth and City of Launceston mines now belong to the New Pinafore Company, which bought them at the same time as they acquired the battery formerly belonging to the Native Youth Company. The total yield of gold from the City of Launceston mine was of the value of £10,000, and the Native Youth gave £95,589. In 1883 Mr. Thureau gave the total yield to date as 23,350 ozs., and the dividends as £28,437 10*s*.

These mines were last worked in 1887 to 1889, when they were let on tribute to Mr. W. H. Stubs. He has been good enough to let me have a copy of a report dated 20th December, 1888, from which the following particulars are extracted.—"Over 1½ miles of levels &c. were unwatered, made up as follows:—Levels 5637 feet, shafts 1620 feet, crosscuts 615 feet, winzes and rises 425 feet, or a total of 8297 feet in all: this is, of course, exclusive of the stopes, where it would be utterly impossible to make even approximate calculations."

"800 *feet level.*—We started to open out west at this level on the 2nd January, 1888; driving was commenced immediately from the crosscut, the New Native Youth Company not having opened out there. The reef on starting was fully 3 feet 6 inches wide, and continued so for some distance, but eventually became very small and country hard. No gold was seen in this level, and the characteristic minerals, such as galena, black jack, (blende), and copper pyrites, which attend the gold-bearing portion of the lode, were conspicuous by their absence. The total distance driven on this level is 132 feet, and it is at present suspended: reef in the end very small."


— NOTE— Workings above 115 feet level are taken from a sketch and are not to scale – Shewn by dotted lines.
CITY OF LAUNCESTON
MAIN SHAFT
Reef 3' wide in this block, no gold to be seen
Very poor
Very poor
Stubs' Tribute 2083 Tons crushed for 925ozs 15dwts 20grs.
Stubs' Tribute 1525 Tons crushed for 901ozs 14dwts 6grs gold
Very Poor
Very Poor
1.9ft 6in. Barren
160ft Barren
115FT LEVEL
200FT LEVEL
300FT LEVEL
365FT LEVEL
425FT LEVEL

NEW NATIVE YOUTH, CITY OF LAUNCESTON, AND EXCELSIOR MINES.

LONGITUDINAL SECTION LOOKING NORTH

Scale of Feet

Ground worked out shewn thus

level." The mine was then let on tribute, but the tributors were unable to keep going [illegible] an workings were allowed to fill with water, and the machinery was sold off. The water [illegible] as kept under by a 7-inch plunger.

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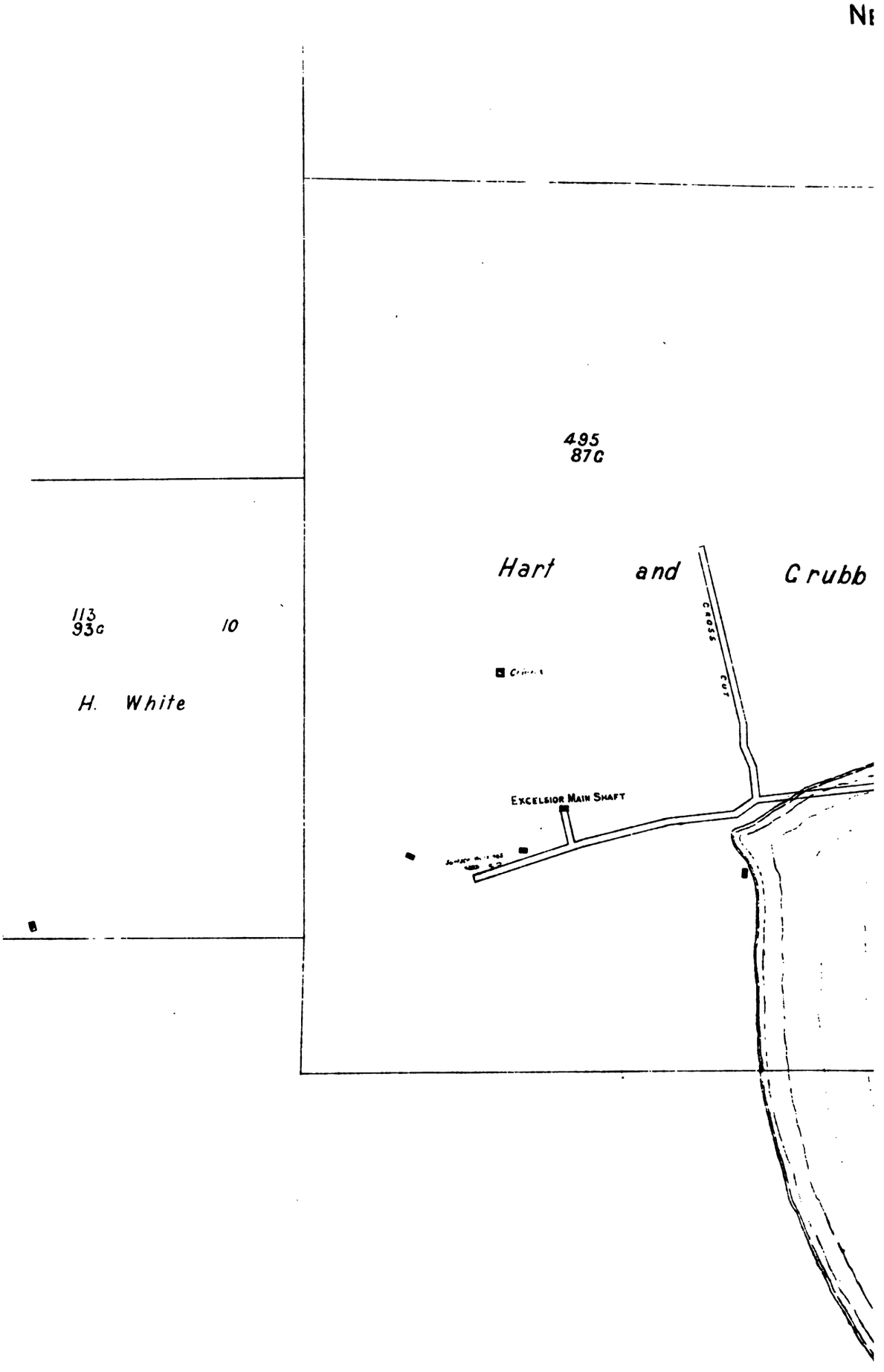
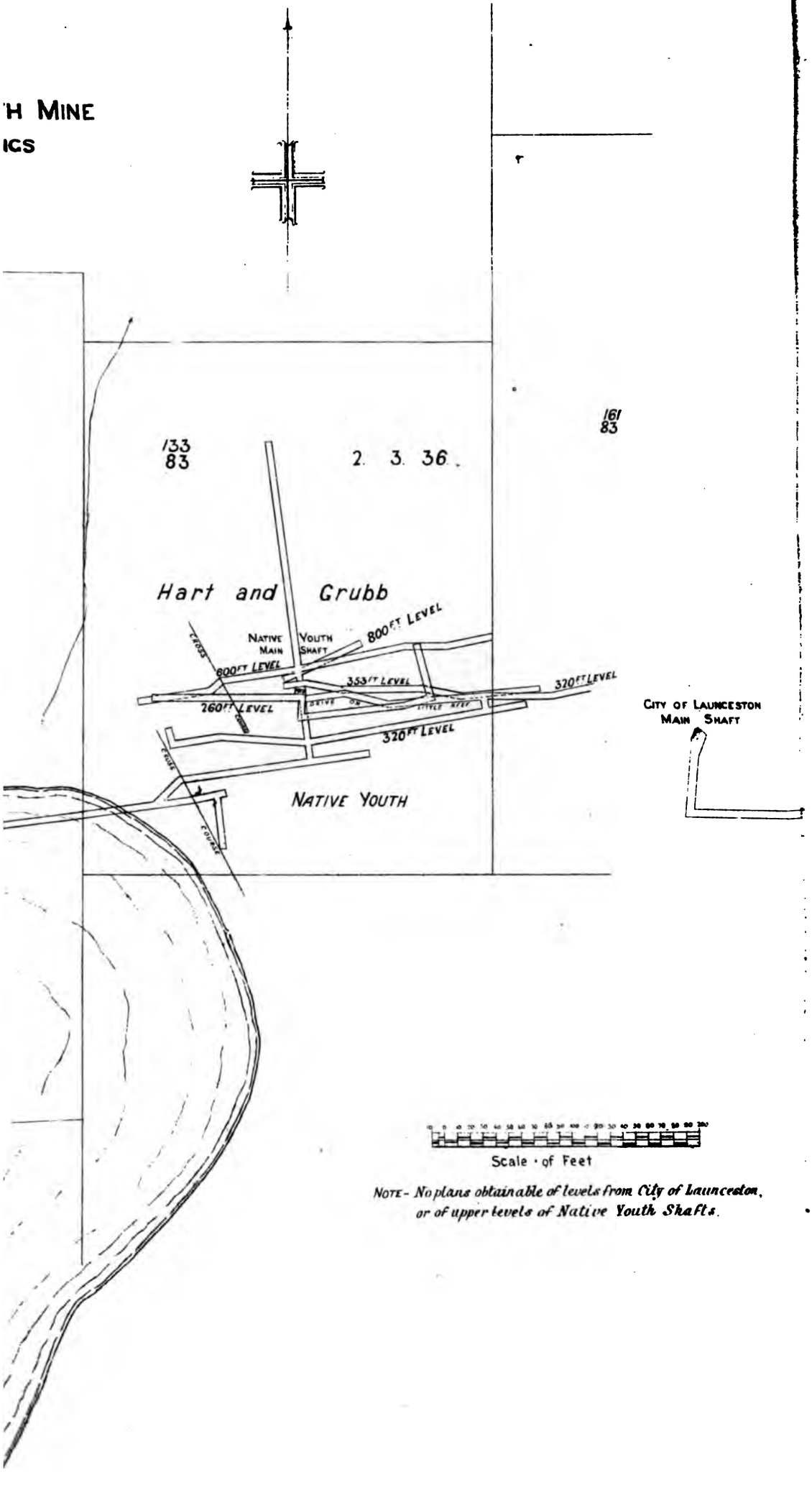
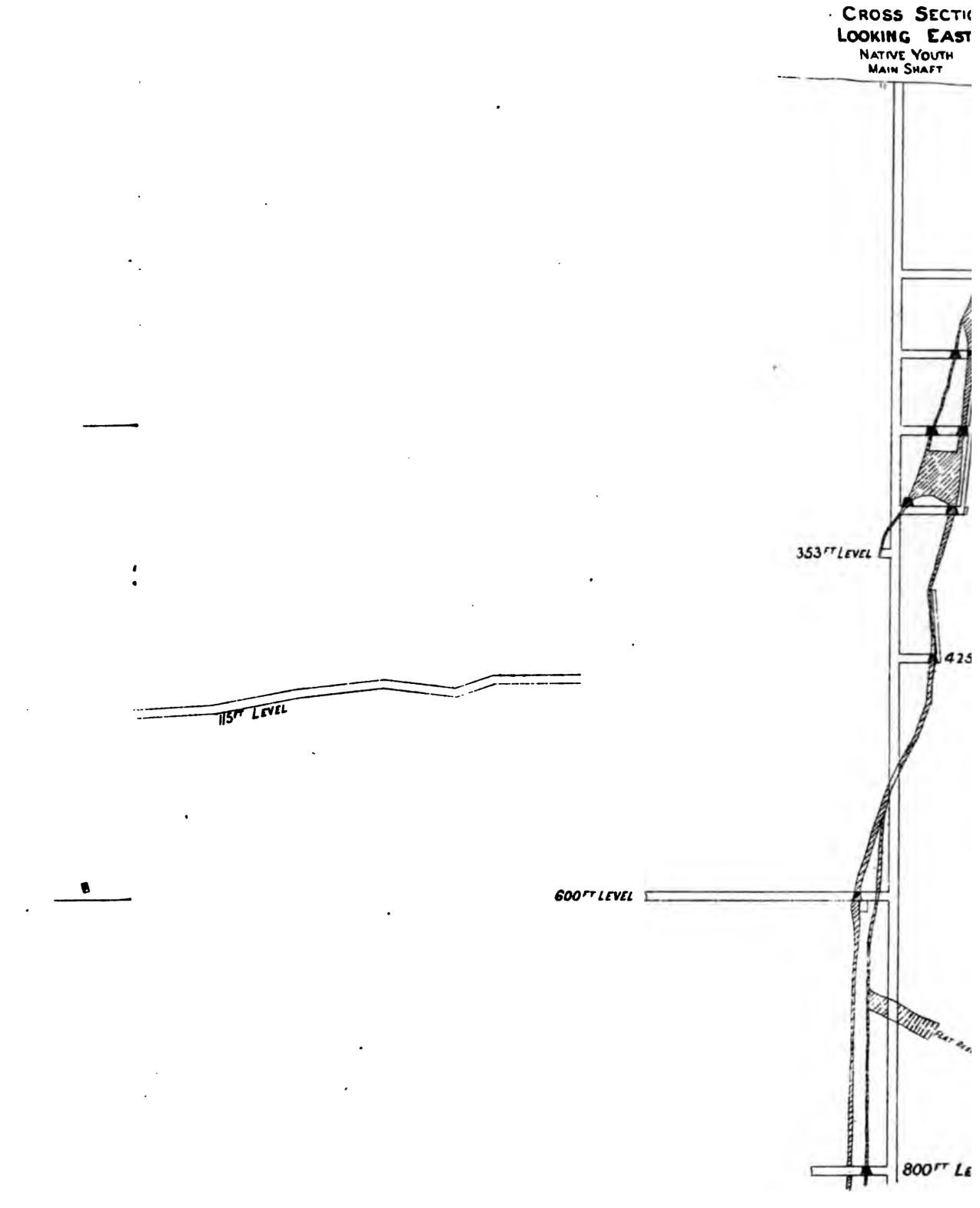

N
495
87C
Hart and Crubb
113
93C
10
H. White
Cross Cut
EXCELSIOR MAIN SHAFT

'H MINE
IGS



NOTE- *No plans obtainable of levels from City of Launceston, or of upper levels of Native Youth Shafts.*


CROSS SECTI
LOOKING EAST
NATIVE YOUTH
MAIN SHAFT
353FT LEVEL
425
115FT LEVEL
600FT LEVEL
800FT LE

"800 *feet, East Level.*—After cleaning out the old level and laying tramway, work was commenced at 125 feet from the crosscut. The reef was found to be very small, but improved in appearance and size as it was driven on. A few colours of gold were obtained, and a rise put up to test the value of the stone, but we could not succeed in getting any more. The walls in this level were very hard and clean, with a slight underlay south, or contrary to their true underlay. The total distance driven in this level is 227 feet 6 inches. It was deemed advisable to suspend operations here also, there not being sufficient encouragement to warrant any further outlay; the tramways were pulled up and sent to surface, when work was resumed at the No. 3 or 320 feet level.

"*No. 3, North Leg.*—This supposed "leg" or "branch" of the main lode was opened out upon from the cross-cut; reef 15 inches wide, of a very promising appearance. The reef was driven on for a distance of 47 feet, and averaged about 12 inches of very fine-looking quartz. A few specimens were obtained after driving about 15 feet, which in all probability will be further tested at some future date.

"*No. 3, Main Reef.*—We started driving at a distance of 76 ft. 6 in. from the main cross-cut, where the New Native Youth Company left off. We had only driven about 15 ft. or 20 ft. when gold was discovered. After continuing the level on a few feet further a rise was put up and struck payable stone. A crushing from this portion of the mine was commenced on the 4th May, when 230 tons of quartz were crushed, yielding 71 oz. gold. Having seen no hanging-wall in this level we put in a cross-cut (which we now call No. 2) north at a distance of 141 ft. 6 in. from the main cross-cut. The hanging-wall was struck 17 ft. 6 in. from the footwall, and we were pleased to find fairly good stone accompanying it, which lasted about 25 feet both east and west, when the stone gradually become poorer. In the meantime the foot-wall level was pushed on, but the reef on this wall was very small and carrying no gold: we therefore suspended work in this level and confined ourselves to the hanging-wall level, which was carrying nearly all the gold.

"*Eastern Level on Hanging-wall.*—This level has been driven 119 ft. 6 in. from No. 2 cross-cut, but during the last 70 ft. or 80 ft. little or no gold has been seen: the reef in the end is 2 ft. 6 in. wide. We are now within 35 feet of the City shaft, but have ceased working here for the present."

"*Western Level on Hanging-wall.*—We drove this level a distance of 65 feet from the No. 2 cross-cut, when, the stone being very poor, driving was discontinued. For the first 25 feet the level carried very fair gold. In order to prove whether the little reef was in any way connected with our hanging-wall I decided to drive the required distance of 29 ft. 6 in. We have since broken through into the level we started on the north "leg," which now proves conclusively that the hanging-wall of the main lode is identical with the hanging-wall of the north "leg," or little reef. This level has been driven a distance of 264 ft. 6 in.

"The total number of feet of levels driven since January, 1888, is 688 ft. 6 in., and cross-cuts 39 ft. 6 in., or a total of 728 feet in all.

"The amount of stone raised and crushed since the 4th May last is 1728 tons, yielding 739 oz. 16 dwt. of gold, being an average of 8 dwts. 13½ grs. per ton, valued at £2959 4*s*."

The record of the New Native Youth mine is a very good one for the amount of ground laid open, and in my opinion the mine has only to be vigorously explored in depth to again become a large producer of gold. The lode is a strong well-defined one, and will doubtless live to any depth to which it can be followed, and the chutes of ore have been very considerable in size, as shown by the amount of ground that has been stoped out. The venture of opening this mine once more and working it at lower levels is to be commended as a thoroughly genuine and legitimate mining enterprise.

On Sections 92-93G and 178-93G several shafts have been sunk to look for the eastward continuation of the Native Youth reef, the largest being that of the East City of Launceston mine, near the south of Section 92-93G. This is long since dismantled and fallen in, and I have not been able to find what depth it was or what work was done from it. Some gold-bearing leaders are said to have been met with, but no lode.

The small shaft in the angle of Section 161-83, seen on the plan, a few chains W.S W. of the East City of Launceston shaft, was sunk 100 feet, and a small east-and-west leader is stated to have been cut. Another shaft, shown on the plan north of this one, just inside the boundary of Section 92-93G, was sunk 70 feet, and then some driving was done, of which I obtained no particulars. A winze has also been sunk some 30 feet, but I understand that no lode was found.

In the long excavation sluiced out by the Lefroy Hydraulic Sluicing Association, in Sections 501-93G and 583-93G, quartz with gold in it was obtained occasionally, and some veins of lode-matter were noticed in the bedrock. From its position it seems likely that this trench would cut the Native Youth reef, but it is not certain that it did so, and, possibly, it does not extend far enough south. If any of the veins seen in it really are the lode, this must here be small and split up, or else changed to a large slaty "formation," which might easily escape notice in sluicing if it did not happen to carry gold where cut.

In Section 178-93G, on the east side of the Cemetery Road, are some small shafts sunk by the Golden Light P.A., in one of which some gold-bearing leaders are stated to have been cut. These seem rather far south to be the Native Youth reef, and too much to the north to be on the Hit or Miss line.

Sea View Reef.—Away east of the Deep Lead, on Section 294-93G is a lode, which from its position might be part of the Native Youth line. The main shaft is close to the western boundary of the section, and is 60 feet deep. East of it a short distance is an underlay shaft 36 feet deep, in which some gold was got. From the bottom of the shaft, at 60 feet level, a little driving has been done on the lode, which here was from 4 to 7 feet in width, containing a little stibnite and "colours" of gold at times. The underlay agrees with that of the Native Youth reef, being to the north about 1 in 3. West of the shaft the lode has been traced for some chains as shown on the plan, but becomes small, and nothing has been done on it except shallow trenching. The country in this vicinity is mostly hard slate.

Hit or Miss Line of Reef.—This is a small line of reef, and does not appear to extend far either east or west, but is a true fissure lode, and is gold-bearing. The main shaft is shown on the general plan, near the north-west angle of Section 65-93G. My last visit to this mine was on 4th September, 1896, since when the workings have been extended, but the particulars now given are up to the date named. The shaft is 272 feet deep, with levels at 185 feet (No. 1) and 263 feet (No. 2). Many years ago the reef was worked near surface, and yielded gold-bearing stone, but no particulars are available as to the extent of the workings or value of the ore extracted. The present owners are the New Hit or Miss Gold Mining Company, No Liability. At the 185 feet level the lode is north of the shaft. A cross-cut has been driven eastward, and cuts the reef 50 feet from the shaft, then the line of the lode is followed for 182 feet. For the last 94 feet the course is more to the north than previously, the bearing being about N. 60° E., and the quartz has become very small, there being three parallel veins, with only about ¼ inch to 1 inch of quartz on each. The fissure appears to be dying out in this direction altogether, becoming a mere joint or divisional plane in the country, which is mainly sandstone, but the strings of quartz contain a little gold, and though small are very distinct. At the above bend in the reef a cross-cut has been driven 108 feet to the south-east, following for most of the distance a smooth divisional plane in the country dipping N.E. 63°. The cross-cut is almost exactly along the strike of the beds of country, which here run N. 33° W., and dip S.W. from 40° to 45°, the joint followed therefore cutting them nearly at right angles. A little quartz is often seen along this joint, but no faulting appears to have taken place. Other shorter cross-cuts have been driven north and south further back towards the shaft in this level, to make sure that the reef has not been faulted by a sort of cross-course which has been met with, but there does not seem to have been any perceptible heave. On the east side of this cross-course a rise has been put up 50 feet, on gold-bearing stone, and 40 feet up the lode was followed east for 20 feet, but became small and poor. To the west the cross-course was cut through, and proved to be 4 feet wide, but the reef became very small. The gold-bearing stone seemed to be confined to a few feet on the east side of the cross-course.

North of the shaft the reef was cut at about 9 feet, and has been followed 26 feet east and 24 feet west. In the west end is a fault 6 to 15 inches wide, filled with quartz veins, pug, and squeezed slate, with fairly defined walls running N. 85° W., and dipping 60° to the north. In the east end a rise has been put up a distance of 50 feet in broken lodestuff. A winze has also been sunk to the bottom level.

In the chamber and shaft there is a seam of pug about 18 inches wide, running north-westerly and dipping south-west. In the workings from the winze this cuts through the lode, but does not heave it more than its own width. The cross-courses of one sort and another met with in this mine are numerous, but do not appear to displace the lode appreciably, yet have a great effect on its size and value, the stone being strong and gold-bearing on one side of them and not on the other.

At the 263 feet level the reef was 35 feet north of the shaft, the underlay to the north being therefore 26 feet in 78 feet, or 1 in 3. The lode has been followed 45 feet west and 33 feet east, and is from 1 to 4 feet in width between the walls, the quartz being from 8 to 12 inches wide. At this level the lode has hard smooth walls, and is much more distinct than in No. 1 level; a little gold was in it in the east end.

One crushing of 33 tons of stone from this mine, in August, 1895, gave 8 ozs. 15 dwts. of gold.

This lode is parallel to the Native Youth lode both in strike and dip, and may be regarded as a "companion lode" to it; it does not appear to be one of the main lode fissures of the district. In the bottom level it certainly looks much more promising than in the upper one, and in my opinion it will live downwards, and may likely become larger. It can hardly be recommended as a good mining venture if it has to be developed from a shaft of its own, but would be worth cross-cutting for from the Native Youth line at some of the deeper levels. It underlays into the New Native Youth (now New Pinafore), Section 161–83, and to the westward passes into Section 496–87G. This has prevented much work being done on it to the westward by the present owners. The reef is much stronger in the west end than in the east, and requires proving in that direction. This could well be done from the existing shaft at the bottom level, and seems to me well worth doing.

The cross-cut in the east end at the No. 1 level was put in to try for the Golden Point lode, seen running north-easterly through Section 160–83 on the general plan. It seems doubtful, however, if this will pass through the Bain and Richards' reef, lying north of the Golden Crown shaft, now to be described.

Bain and Richards' Lode.—This is a reef with the usual course of the lodes of the Lefroy district, which has been well traced by trenches through Sections 905-87G and 160-83, but has had very little deep mining done upon it. Its western extremity appears to be at the Old Wideawake shaft, 70 feet deep, close to the eastern boundary of Section 245-93G. The reef in a surface trench south of this is very small, only about 2 inches of quartz, and I was told that it was not seen at all in a cross-cut from the bottom of the shaft. From three to four chains east of this shaft a little gold was found in the reef, but nothing of consequence. Going down into the low ground on the east of Section 905-87G the lode becomes larger, being up to 15 inches of quartz, but carries little or no gold. In Section 160-83 it has been cut in several prospecting shafts, but has not proved valuable. It is probably seen in the workings from the Golden Point and Crown mine, but this is not yet quite certain.

About 12 chains west of Section 268-93G is a whip shaft some 60 or 70 feet deep, put down to work a small leader cut on surface, which corresponds fairly well in position with the Bain and Richards' line. This leader is very small and does not appear to be of much consequence, and it need not necessarily have any connection with the Bain and Richards' line.

New Golden Point and Crown Mine.—On the general plan two large shafts are shown in Section 160-83 close to a line of lode running north-easterly: these belong to the Golden Point mine. North-east from them, just east of the boundary of Section 64-93G, is the main shaft of the Golden Crown mine. Both these mines are now held by the New Golden Point and Crown Gold Mining Company, No Liability. The northern one of the two large shafts of the Golden Point is the main shaft: it has been full of water for some years, and I have not been able to obtain full particulars of the workings from it. According to a plan made early in 1890 the main shaft was 180 feet deep, and considerable work had been done above the 100 feet level. The lode was cut 30 feet south-east from the shaft and followed north-east for 116 feet: it then divided into two branches, the eastern one keeping the old course of the reef was followed for 21 feet, while the western one ran N. 12° W. for 49 feet. To the south-west from the cross-cut the lode is shown as having been driven upon for 123 feet, and two winzes from surface connect with it. A large amount of stoping was done above the 100 feet level, and some very rich stone was obtained. The lode underlays to the north-west. I have no information as to the work done at the 180 feet level from the Golden Point shaft.

In the Golden Crown shaft on the occasion of my last visit on 5th October, 1896, the depth sunk was 345 feet, and it was intended to open No. 4 level at 330 feet. I believe the shaft has since been sunk deeper. The mine has the following levels,—No. 1 at 94 feet, No. 2 at 190 feet, and No. 3, 270 feet, besides intermediate levels at 210 and 236 feet.

At the No. 1 level there is a cross-cut to the south 105 feet to cut a lode from 3 to 5 feet wide, running east and west. A little stoping has been done on this, and three winzes have been sunk. This lode is driven upon to the east 86 feet. These particulars are from a plan given to me by the Mining Manager, Mr. A. Tarrant; the level, being dammed full of water, was inaccessible. North of the shaft is a cross-cut 88 feet in length, through disturbed country, with occasional strings and bunches of quartz. At 78 feet from the shaft an irregular break in the country was followed north-westerly for 40 feet; 24 feet in this met with a sort of lode-channel running a little north of east, which may be Bain and Richards' reef. I do not think, however, that the cross-cut has gone far enough north to be into undisturbed country, and it seems quite possible that Bain and Richards' reef is still ahead of it. No ore of value appears to have been got in this level. The country south of the shaft lies in very flat beds, and appears little disturbed, but it seems very probable that all the north cross-cut is in a wide lode "formation," which at this point carries little quartz. It probably is due to the shattering of the country in the acute angle between the Golden Point and Bain and Richards' reef.

In sinking the shaft at 110 feet down, a big "formation" carrying a good deal of quartz was cut, and at 145 feet the Golden Point reef was met with 2 inches to 8 inches wide, carrying gold. At 190 feet a cross-cut was driven north 75 feet, and passed through a hard "formation" carrying several veins of quartz for 37 feet, then got into more settled country, which still carries numerous quartz leaders. A cross-course running W.N.W. was met with 13 feet from the shaft, dipping to the north about 80°; this heaves the lode about 10 feet north, but is probably only a local displacement in the "formation." Some good stone was got in this level, but the quartz was in short blocks and irregular bunches, very difficult to follow, smooth divisional planes occurring plentifully, and faulting the stone in a most perplexing manner. In the intermediate levels at 210 and 236 feet the principal body of stone is on the course of the Golden Point lode, and at 236 feet it was a fine large body of good quartz, but there were also several veins of stone carrying gold running in other directions without regularity.

At the 270 feet level a cross-cut was driven south 70 feet through hard black slate, much twisted at times, which is still very probably in the shattered zone or "formation." The lode at

this level was still very irregular in shape and blocky in character. The main portion of it is cut at 26 feet from the shaft in the north cross-cut. This went north in all about 75 feet, and at 72 feet struck a hard wall. Between this and the lode the rock was full of quartz-leaders. The wall has been followed N.E. 48 feet and S.W. 13 feet; there is about 3 feet of broken lode-matter on it and a little gold. Its strike corresponds better with that of the Golden Point lode than with Bain and Richards'.

At 329 feet in the shaft a leader cut close to the shaft in the south cross-cut at 270 feet came in carrying payable gold, and at 345 feet, when I last visited the mine, there was in the bottom of the shaft from two to three feet of lode-matter with one foot of payable stone. This is quite in the foot-wall of the stone worked at the 270 feet level, which is north of the shaft.

Owing to the very irregular distribution of the quartz this has been a very difficult mine to work, especially at first, when the amount of work done was not enough to show the true character of the occurrence. It is now pretty clear that here we have a wide zone of shattered country in the irregularly shaped fissures of which quartz has formed, consequently ore may be found anywhere between the main walls of the shattered zone, and a great deal of cross-cutting through it becomes necessary. The country being hard strong slate and sandstone has not been crushed into mullock as in parts of the New Pinafore and Volunteer "formations," but shows the effect of the displacements that have gone on by the irregular jumbled manner in which the blocks of rock are disposed, and the frequently contorted stratification of the slates. A continual dripping of water all over the mine also testifies to the shattered condition of the rock.

Not having examined the workings of the old Golden Point mine, which have been shut down for some years, I am unable to say if it also presents the characteristics of a shattered zone "formation," but, judging from the way the levels branch to the northward on the plan of the 100 feet level of the mine, it seems probable that it did to some extent. The quartz body, however, appears to have been much better defined than in the present workings.

It seems most likely that the Golden Point lode is a cross lode between Bain and Richards' reef and the Australasian reef, both of which have the normal strike.

The work in progress from the Golden Point No. 1 mine in Section 143-93G should do much to throw light on this question. The writer's opinion is that it is unlikely that the cross lode will extend far past the lines of the normal lodes on the north and south of it.

The policy of the management of the present mine has been to keep sinking on the known chute of ore near the shaft, in the belief that the lode will become a more defined body of quartz in depth. This improvement is very probable, and the way in which the quartz has made stronger and stronger at each lower level is very encouraging. While thoroughly commending the policy of sinking, and giving great credit to the mining manager for the able manner in which he has followed the quartz in a peculiarly perplexing mine, it nevertheless seems to me that extension of the upper levels is also very desirable and advisable, and that the "formation" should be cut across in several places from wall to wall into plainly solid and undisturbed country. The quartz in this mine has been of very good quality, some of it among the richest ever found on the field, and the prospects of it are, in my opinion, very good if systematic opening of the ground is persisted in. It is very likely that in depth the "formation" may make into a much more defined lode. It seems especially advisable to try to find the junctions of the cross lode with the two east and west lines of reef to the north and south of it.

The old Golden Point mine yielded gold to the value of £15,000. On 22nd October, 1896, the New Golden Point and Crown mine had given 1175 tons of quartz, which yielded in the mill 1005 ozs. 11 dwts. 2 grs. of gold, worth £4020. On November 3, I have noted from press reports, another crushing of 215 tons of quartz yielded 204 ozs. 15 dwts. gold of value £816, and there have been later crushings of which I have no record.

Australasian Reef.—The main shaft of the New Australasian Gold Mining Company, No Liability, is seen on the general plan in the north of Section 326-93G. Very little work has been done on this lode, and at the time of my survey the mine was shut down, Mr. W. H. Stubs, who was in charge, has kindly given me the following particulars:—"The surface workings consist of several small prospecting shafts, varying from 10 to 22 feet in depth, and in some places connected with each other. A small reef was discovered, and at times carried sufficient gold to warrant sinking a main shaft, which was accordingly done. The shaft, 9 ft. 6 in. × 3 ft. 6 in., was sunk to a depth of 110 feet from surface, and a cross-cut put in at 100 feet, and driven 55 feet south. At 45 feet the reef already referred to was met with, but was not more than 6 inches wide and of no value. The reef was then driven on in an easterly direction for a distance of 48 feet, and varied in width from 3 inches to 20 inches, and invariably carried a high percentage of pyrites. At the end of this level a rise was put through to one of the small prospecting shafts where the reef had already been cut, and, strange to say, with the exception of the capping of the lode, scarcely a "colour" of gold was obtained. The lode throughout the rise was of most promising appearance. Immediately under the "wash" that overlaid the reef some good prospects were obtained, the gold assuming a ragged appearance, and pieces weighing up to 10 grains being revealed."

In Section 143-93G a number of prospecting shafts have been sunk nearly on the line of the Australasian reef, and also to the south of it, but, so far as I could learn, nothing of importance was cut in any of them.

Brisbane or Prince of Wales Line.—In the north-east portion of Section 1029-87G are seen some old workings executed by the Brisbane Company, now long shut down. The main shaft is said to have been 150 feet deep. The lode was very small, but contained nice-looking slickensided stone. One crushing from this lode is said to have given a payable return, but the vein was too small to be worked profitably. In the north-west of Section 332-93G a vein was cut in a small prospecting shaft 25 feet deep, the width between the walls being four feet; it was taken for the Tablier reef, but, according to the survey, seems more likely to be the Brisbane line.

In Section 249-93G is shown on the plan the shaft known as the Duke of Argyll, about the depth of which I have no information. Very little quartz is seen about the mouth of the shaft, so it is doubtful if a reef was cut; it is situated nearly on the line joining the Brisbane and Prince of Wales workings.

The last named workings are shown on Section 234-93G, and consist of one fairly deep shaft and several smaller ones and trenches on the line of the lode. The only information I have as to this reef was kindly supplied to me in a letter dated 5th November, 1896, by Mr. G. Beedham, of Hobart: he says:—"About 17 years ago 10-acre Section 234-93G was opened by sinking a shaft 50 feet, and 50 tons of stone were crushed at the Native Youth battery from a well-defined lode at the 50 feet level, 5 feet wide, which gave 19 dwts. to the ton. At 75 feet a still better crushing was taken out. At 100 feet the lode was struck again, but broken up and impossible to get a crushing out on account of the great influx of water. The lode underlays south."

Tablier Line.—The main Tablier shaft is shown on the general plan a little south of the centre of Section 1029-87G; it is said to be 100 feet deep; a reef of 3 feet of quartz is said to have been struck, but no gold in it. Another shaft east of the creek is 70 feet deep and got a big lode, also of no value. I have no further information about this mine, which has been shut down for some time. West of the shaft in the next section are several small shafts, in two of which a vein of quartz was cut. From the position on the plan it would seem likely that this vein connects the Brisbane and Tablier lodes. On Sections 66-93G and 332-93G the Tablier lode is traced by a number of small shafts and trenches from the top of the spur in 66-93G to the flat gully in 332-93G. In this gully the alluvial matter was too deep for trenching on the reef. The latter has an underlay to the south, and in some of the trenches gave a little gold.

Windermere and Monkland Line.—Still going south we next come to a line of reef on which a great deal of shallow working has been done, and from which good gold-bearing stone can often be obtained, though only in very small quantity. The New Windermere G. M. Company's workings are shown on the general plan on Sections 1024-87G and 51-93G. The main shaft is nearly on the boundary between the two sections. It was full of water when I saw it, and I could not get particulars of the workings. On the ridge in 51-93G several shafts up to 51 feet in depth have been sunk, and some driving on the lode done. The vein of stone is very small, and underlays to the south. Near the N.E. corner of 51-93G is the old tunnel, now fallen in, of the East Windermere Company, in which large blocks of quartz appear to have been obtained, but I am not aware at what point in the tunnel these were met with. According to the plan of the surface workings this tunnel would require to be put in a long way, from 300 to 400 feet at least, to cut the Windermere lode. On the east side of Section 51-93G a great deal of trenching has been done, but the lode is lost sight of for a time. On the slope down from the Main Road gold-bearing stone from this lode is frequently picked up. The reef, however, appears to be only a small one, and the only hope for successful working is that it may get larger in depth. It agrees so well in position with the Monkland line that there can be little question that the lodes are one and the same, and if so the fissure must be a fairly strong one, and there is consequently encouragement to believe that it will go down deep, and possibly get much larger.

The Monkland reef is shown on Section 742-87G. The main shaft is 110 feet deep, with a level at 95 feet. The lode was cut by a cross-cut 43 feet north from the shaft, and was then followed east 5 feet and west 65 feet. No stoping was done, and the reef was very poor, if not quite barren. This work was done by the last owners, the New Monkland G. M. Company. There are several older workings from which gold was taken, and I am again indebted to Mr. W. H. Stubs for particulars. He says (7th November, 1896):—"On this mine a good deal of surface cross-cutting has been done, and a fine solid body of stone uncovered for about 150 feet. Some years ago a main shaft was sunk 70 feet, the lode struck and proved to be very solid. Only a few feet of driving was accomplished, and about 30 tons of stone brought to grass, but was supposed at that time to be too poor to crush. Several small shafts were sunk on the lode, which produced about 100 tons of stone, the whole of which was crushed in small lots and yielded from 2½ dwts. to 6 dwts. per ton."

Rifleman Lode.—Away to the west of the field on Section 187-93G a small lode has been cut on about the line of the Windermere reef, though it is hardly likely that they are identical, The workings on it are mostly very old, and I did not get any very certain information that gold had ever been obtained. The lode appears to underlay to the north. The shaft sunk a few years ago by the Rifleman Company seems to be about 50 feet deep, but is not now accessible for measurement. The lode seems small and unimportant, and is in very hard slate country.

Reward Lode.—Towards the north-west of Section 1015-87G is the highest point on what is known as Specimen Hill, from the number of pieces of auriferous quartz that used to be found there. A great deal of trenching and shallow shaft-sinking has been done in this vicinity, which was one of the first places worked for auriferous quartz on the field, the discoverer of the Reward lode obtaining a reward of £3000 for finding a payable goldfield. The old workings on this lode outcrop are seen on the general plan a little north of the centre of Section 1015-87G, and south of the Reward main shaft. The old workings are said to be from 70 to 100 feet deep, and underlay to the north. 70 tons of quartz are said to have given 140 ozs. gold. North of the main shaft is an underlay shaft 60 feet deep, on a vein underlaying to the north in which there was gold-bearing quartz near surface. Another small lode underlaying north is seen in a small shaft west of the main one; and still another lies about 68 feet south of the main lode. Two levels have been opened from the main shaft at 108 feet and 250 feet. In the upper level a cross-cut was driven north 159 feet, cutting veins of quartz at 6 feet, 66 feet, and 113 feet. The first one was followed east 16 feet and west 64 feet, and the second driven upon for 40 feet to the westward. The first vein underlaid to the north, the other two to the south. At the bottom level the first lode was 6 feet from the shaft, and was followed east 23 feet and west 64 feet, the lode being from 2 inches to a foot in thickness. A rise was put up 46 feet, and the lode followed on the south side of the shaft. Here it contained gold, and some very rich stone was taken out, but proved to be only a small bunch. At 80 feet from the shaft, going still north, the cross-cut passed through 12 inches of quartz and soft lode-matter dipping north, and at 160 feet some threads of quartz were cut.

The lodes do not appear to fault the country, and resemble the Hit or Miss reef in many respects, being at times a mere divisional plane in the rock. As in the Hit or Miss, the best hope of success appears to lie in sinking, but there is not a great deal of encouragement to do this. I am not quite satisfied that the lode worked in the old days to the south of the shaft has yet been cut in the later workings, and would recommend some cross-cutting to the south to make sure.

In the north-east corner of Section 52-93G is the main shaft of the Research Company, but I did not find out the depth, or learn if a lode had been cut. I believe work was suspended before any cross-cutting was done.

Both the southern Reward lode and the one next to be described, the Queen's Birthday line, are seen on the plan to bear towards the south of east, as if making towards the Land o' Cakes line of reef. It is rather probable that they are offshoots from this major reef.

Queen's Birthday Lode.—This is shown on the plan passing through the south boundary of Section 1015-87G, and apparently dividing into two branches, one of which runs into 18-93G and the other into 1020-87G. No work was going on along this lode at the time of my visit.

The main Queen's Birthday shaft was 140 feet deep, and is near the south-west corner of 1015-87G, now owned by the Reward Company. A little driving is said to have been done to the eastward on a soft "formation." West of the shaft the lode has been traced across the Launceston road by a number of prospecting shafts. It has also been cut to the eastward in some shallow shafts. In the north of Section 18-93G is another shaft sunk 80 feet deep by the Reward Company. At the 70 feet level they drove south 20 feet and cut the Queen's Birthday lode 3 inches wide of quartz, but with no gold. They also drove 200 feet north, but cut no recognizable lodes.

The vein cut east of the shaft in Section 1020-87G is seen in some shallow trenches on surface and seems small and of little consequence.

Land o' Cakes Line of Reef.—This long line of lode may be traced with considerable certainty from the Mole Creek and Zeehan Prospecting Association shaft on Section 147-93G through the Admiral, Clansman, New Waverley, Land o' Cakes, Fortune of War, and Captain workings to the Launceston road, and then appears again in the old Bannockburn and Specimen Hill workings in the south of Section 18-93G. Still further east it is quite possible that the Pioneer Company's workings are on this line. The western workings on this line are shown as fully as possible on the plan and sections of this and the Volunteer line of reef forwarded herewith, so it will not be necessary to fully describe the workings, except in the eastern portion, where no drawing of them has been given.

The lode is usually a wide mullocky "formation," showing numerous signs of repeated movement of the walls. It is very probable that both this and the adjoining Volunteer reef should be regarded as a main fault in the country. They will probably be found ultimately to be connected by numerous cross-fissures.

Mole Creek and Zeehan Mine, Section 147-93G.—The main shaft is down 100 feet, and a level is opened out at 95 feet. The lode was cut in the shaft at about 80 feet underlying south, and the footwall came in in the bottom of the shaft. A cross-cut was put in to the south 10 feet, and then a drive was made eastward on the hanging-wall a distance of about 30 feet. The "formation" was 10 feet wide of mullock and rubbly quartz. A few "colours" of gold are said to have been got by vanning, but nothing at all approaching payable stone. The walls were smooth and pretty regular. Two other shafts shown on the plan near the main one were each 30 feet deep, and cut the "formation," in which it was stated there was a little gold. The mine had been shut down for some time when I saw it.

Sections 60-93G *and* 62-93G.— In these the lode is seen to have divided into two branches, nown as the Admiral North and South lodes. The south lode has been cut by the shaft and trenches hown on the plan, and is a wide rubbly "formation," in which little or no gold has been found. he workings on the north lode also are shown on the drawings, but have been of no importance n either of these Sections. The north branch appears to die out going westward.

Section 1016-87G.—In these, known as the Clansman workings, the south lode has only been st in one or two small shafts, and has been of no value. The north lode has been traced through he section by a succession of shafts. In the underlay shaft it was a big mullocky "formation" over 2 feet wide, but had no gold. There was a little gold in the shafts to the west of this, but nothing ayable. East of the main shaft gold was taken from the Peden P. A. prospecting shaft, 175 tons elding 10 dwts. of gold to the ton. The Peden P. A. whip-shaft east of the prospecting shaft ave 20 tons of quartz which gave gold at the rate of 12 dwts. per ton.

Section 53-93G.—At the 180 feet level of the Caledonia main shaft the cross-cut north cut the de, well defined but with the wall running a little to the south of east: this might perhaps be due a junction with the south lode of the Admiral and Clansman mines, which might be expected to in the north lode in this vicinity. In the 80 feet level going east the lode had no true walls and o quartz, but was only a mullocky "formation." Driving west they had to go 116 feet before any old was met with. The best gold in the old Caledonia mine was got in the prospecting shaft orth west of the main one, on a branch of the main lode; 10 tons from this gave 24 ounces of old, and another crushing of 40 tons yielded at the rate of 9 dwts. 2 grs. to the ton. This branch f the lode was cut again further east in the New Waverley Company's prospecting shaft, which is ank 70 feet on the underlay; near the surface there was a little gold in this. Lower down there as very little quartz, but from 6 to 18 inches of a "formation." This possibly also is the lode cut y the North Land o' Cakes Company in Section 180-93G in their workings from the Cakes haft.

The workings from the New Waverley shaft are shown on the plan, with notes as to the ccurrence of gold at different points. The "formation" is very wide and mullocky, and the uartz carrying gold is much shattered and disrupted. The quantity of gold raised from this mine s not great, though some very good ore was at times found in bunches.

Section 59-93G.—The lode has been worked through this section from several shafts shown on he plans and sections. From the old Waverley whim shaft, 160 feet deep, several crushings were aken out which gave 7 dwts. to 15 dwts. to the ton, the quartz vein being about two feet wide. In he Land o' Cakes whip-shaft, 65 feet deep, the lode-matter was 10 feet wide, with 2 feet of pug nd quartz on the hanging-wall, carrying gold. The best mine on this line of reef was the Land o' Cakes, from which a large sum was paid in dividends; the workings from the main shaft are shown on the plans and sections. The last owners, the New Land o' Cakes G. M. Company, sank the shaft to 400 feet, and drove a long cross-cut south at this level. They cut the Land o' Cakes lode and drove upon it, as shown in the plans, a good distance east and west, but the lode was valueless. It was a wide "formation" composed of squeezed and shattered country and mulluck, with a more defined lode-channel carrying smooth polished walls and a little rubbly quartz. The cross-cut was driven south to cut the Volunteer line of lode, passing through somewhat disturbed country all the way. At the 167 feet level the North Land o' Cakes Company drove a cross-cut north across the boundary from the old Land o' Cakes workings, and cut a parallel lode four feet wide, but there was no gold in it, and no driving was done. The machinery on the mine was not strong enough, and a new main shaft required, consequently the mine was shut down. Its record in the upper levels being a good one, it seems to be worth a thorough mining trial at greater depth still than has yet been reached, and also at say 300 feet below the old run of gold.

Section 124-93G.—The last owners of this section were the Fortune of War Company, who sank a shaft near the western boundary, and cut a large mullocky lode "formation," but got no gold. Near surface there was some good stone in an old shaft a little further north. The deep shaft near the eastern side of the section is known as the Rob Roy shaft; the foot-wall of the "formation" was cut in it about 70 feet down. At the bottom level, 200 feet, a cross-cut south had to be driven 180 feet before the hanging wall was reached, the "formation" being from 70 to 80 feet wide. The drive east is along the footwall, where there was a little quartz. On the hanging-wall there was no quartz, only pug. No gold was got in this mine. Between this shaft and the Fortune of War shaft the lode is cut in some old shafts shown on the plan and section, but no gold was obtained.

Section 49-93G —The Land o' Cakes lode is traced into this section by means of some old hafts which cut the "formation," but found no gold in it. The Bannock shaft near the north-ast corner of the section, is said to be 190 feet deep, and to have levels driven north from it at 00 feet and 180 feet which did not cut any lode. This seems to be incorrect, for the Captain ompany's long cross-cut has proved that the Land o' Cakes "formation" exists almost at the annock shaft, and the latter must have either passed through it or had it on the north side where

the cross-cuts must have gone through it. It is very slaty, however, and possibly was not recognized as lode-matter. No gold had been got in this lode in the Captain cross-cut up to the time of my leaving the district, and I have not heard of any being found since.

Section 18-93G.—The lode is next seen in the south part of Section 18-93G, where it appears to have two branches. The shaft on the south-west corner of the section was known as the Bannockburn shaft; a mullocky "formation" was cut in a cross-cut north from this. East of this about 7 chains is the old Specimen Hill shaft, which is said to have been over 100 feet in depth. They are said to have driven 200 feet west from this shaft on a mullocky lode 12 feet thick. An old tunnel went in on this lode from the creek where it crosses the north boundary of Section 20-93G, and between this and the shaft a good deal of gold is supposed to have been got. A great deal of alluvial work has been done near the mouth of the tunnel, and it is said that the gold obtained was rough hackly reef gold. There must have been a good deal of gold got here for so much work to have been done. The southern branch of the lode passes through the south-eastern corner of Section 18-93G. The Victory shaft, which was the deepest on it, is shown on the general plan of the district, just south of the north boundary of Section 20-93G.

From the old Specimen Hill tunnel a small lode has been traced nearly due east along the south boundary of Section 1020-87G as shown on the general plan, but seems small and not gold-bearing. It is probably only a branch from the main lode, which most likely follows much the line of the Specimen Gully.

Looking at the Land o' Cakes line from end to end it is seen to be usually a large mullocky lode without much quartz in it. Payable gold has been got in small patches in the Clansman and New Waverley mines and in the Specimen Hill workings, and there has been one large block of good stone in the Land o' Cakes. On the whole, however, the line has proved a very poor one, the amount of work that has to be done to find the patches of stone being out of all proportion to their value. It must be said, however, that at the time the most of the work was done on it the character of the lode as a large "formation" was not always recognized, and there was not the amount of cross-cutting done that is necessary for such an occurrence, so it is possible good patches of stone have been narrowly missed. The line is, however, not any too promising as a mining venture.

Pioneer Reef.—Near the north-west angle of Section 276-93G the general plan shows a shaft sunk by the Pioneer Company on a line of reef traced by shallow trenches, which from its position may be connected with the Land o' Cakes line. Some of the quartz in the old workings is of rather favourable character, but I have not heard of any gold having been got in it. The Pioneer shaft is 90 feet deep, and a cross-cut has been driven 17 feet south.

About 4 chains to the south east along the spur there is another small quartz vein parallel to the above, with a small old shaft on it.

Volunteer Line of Reef.—The principal mines on this lode are shown in some detail on the plans and sections herewith. It is one of the longest lines of lode on the field, having been traced from Section 53-93G on the west to the flat land at the head of the Back Creek Valley on the east. The gold-bearing portion has, however, been confined as yet to the Volunteer and West Volunteer mines, except for a small piece in the old Shamrock mine (now the East Volunteer) and a little in the Adjutant.

The lode in Section 53-93G was first cut many years ago in a long prospecting trench dug from the Land o' Cakes line south to the top of the hill in Section 120-93G. A little gold is said to have been got in it, but most probably this was alluvial. The New Waverley Company sunk a shaft 50 feet and drove north to cut the foot-wall: a little nice-looking quartz was got, but the "formation" was mostly soft lode-matter and mullock; no gold was got. The formation is some 15 feet or more in width.

In Section 59-93G this lode was again cut at the 400 feet level by the Land o' Cakes' south cross-cut at 397 feet from the shaft, and was driven across for 42 feet without getting the hanging-wall. A good deal of water came from this "formation." They drove east on the foot-wall 20 feet on about two inches of quartz which carried no gold: west it was followed for 12 feet and the stone widened out to ten inches, not solid, however, and carried a little gold. The influx of water prevented much prospecting. On the general plan the position of this reef is shown as if it outcropped on surface, allowance having been made for the underlay.

In the north-east corner of Section 635-93G the general plan shows a tunnel driven by the California G. M. Company, which is worth referring to at this point as it bears upon the question of the Volunteer lode going more to the south than its position as shown on the general plan. At 66 feet from the entrance a lode consisting of about 15 inches in thickness of soft mullock and rubbly quartz crosses the tunnel on a course N. 75° E. and dipping south 55°. It is small

and not gold-bearing, but has the normal strike of the lodes of the district. The tunnel is 327 feet long ; it cuts two small slides running north-westerly and dipping to the south-west, but no more lodes are seen in it. The country strata strike N. 30° W. and dip to the S.W. about 40°. To go clear of the south end of this tunnel the Volunteer reef would have to bend a very great deal to the south, and though in the West Volunteer mine there is a branch going off to the south-west, I do not think that there can be any doubt that the "formation" in the Land o' Cakes cross-cut is the main lode.

Captain Mine, Section 49-93G.—The workings of this mine are shown on the plan, and section of the Volunteer line. In the long cross-cut north the country passed through is all somewhat disturbed, the block of ground between two so closely adjacent lines of faulting as the Volunteer and Land o' Cakes lodes being naturally much shaken. At 119 feet from the shaft the hanging-wall of a large "formation" was cut dipping south 55°, and was driven on to the west for 17 feet. Between this and the shaft the country is still a good deal disturbed, as if there were another lode still south of the shaft, and as lode-matter was cut in the Central Volunteer main shaft in Section 114-93G, it is very probable that there is one to be found by cross-cutting south from the Captain shaft. It may be the branch seen in the West Volunteer and West Volunteer Extended. The "formation" in the Captain north cross-cut proved to be 123 feet wide, and the foot-wall was fairly well defined and smooth, of hard laminated sandstone. The wall was followed east and west as shown on the plans, but gave little quartz and no gold. The mass of rock between the main walls was much broken and jumbled mullock, slate, and sandstone.

At 421 feet a small lode was cut running east and west, consisting of from 3 to 18 inches of soft material with smooth walls, underlaying about 1 in 1 to the south. This seems likely to be the reef at the head of the West Volunteer dam in Section 22-93G, known as the Cadet reef, which is due to be met with about this point. If so the Cadet line would appear to be a cross fissure connecting the Land o' Cakes and Volunteer lodes. In the "*Examiner*" of 15th December, 1896, I note that the total length of the Captain cross-cut is 619 feet, and that the Land o' Cakes "formation" turned out to be 78 feet in width from hanging-wall to foot-wall. On the foot-wall there was 15 inches of quartz, but no gold.

Central Volunteer Mine and California Mine—The main shaft of the first-named of these is shown on the general plan towards the north-west corner of Section 114-93G, and that of the latter in the centre of Section 154-93G. Some black polished slate (lode-slate) and quartz were got in the bottom of the Central Volunteer shaft, evidently a lode "formation" of some sort, but I am not aware of any lode-matter having been found in the California shaft. Both mines were shut down at the time of my survey, and I did not obtain particulars of what was done in them. I have not heard of any driving having been done. The shafts were sunk to cut the underlay of the Volunteer lode.

West Volunteer Extended Mine.—The main shaft of this mine is close to the south boundary of Section 22-93G. The line of small shafts shown on the general plan to the east of the shaft are shallow prospecting shafts in which nothing was found, except in the one near the middle of the eastern boundary of the section. This was 65 feet deep ; at 55 feet they drove south five feet and cut a lode two feet wide with no gold in it, which had been already seen in the shaft higher up. As shown on the general plan this is exactly on the line of the main Volunteer lode. Still further north, at the head of the West Volunteer dam, a shaft was sunk on a lode about 2 feet wide, known as the Cadet lode, which has been already referred to in speaking of the Captain mine.

The West Extended Volunteer Company very pluckily decided to test the existence of the lode at deep levels first, and did not open out from the shaft till a depth of 750 feet had been obtained. They then drove a crosscut south and struck what is undoubtedly the main Volunteer lode 27 feet from the shaft. The cross-cut was extended further, but did not cut through the "formation" to the main foot-wall. The hanging-wall was followed east and west as shown on the plan of the mine, but did not yield any gold-bearing quartz. The wall-rock is very solid well-stratified sandstone and slate. At the time of my visit the main foot-wall had not been cut, though there was a very distinct foot-wall to the lode-matter on the main hanging-wall. The cross-cut should be extended right through the "formation," as the most of the Volunteer Company's gold has been on the foot-wall. Owing, however, to the work in the West Volunteer having shown that a branch of gold-bearing stone ran across the "formation" into the hanging-wall, the West Extended Company next determined to crosscut south from their shaft, and did so, cutting two small lodes by so doing. The first was very small, only two to six inches of quartz and soft lode-matter with smooth walls, and does not fault the country strata. It dipped south 78°, and was found 48 feet south of the side of the shaft. At 107 feet in another small lode was found which corresponds very well with the lode worked by the West Volunteer Company; this has been followed east and west as shown on the plans, but remained very small, and did not carry gold. The walls are smooth and well-defined, and underlay south about 1 in 3. The stratified country, which here dips W.S.W. 24°, is not perceptibly faulted by this lode. In the west end when I last saw it the lode was much stronger than in the east face.

The work at the deep level turning out so unfortunately, a start has since been made at the 400 feet level.

The West Extended Volunteer shaft is a good one, and in a very suitable position for provin the Volunteer lode at still deeper levels.

West Volunteer Mine, Section 810-87G.—The workings of this mine are shown better by t plans than by verbal description. On the general plan of the district the new main shaft is se near the south boundary of the section, and the old main shaft further north.

Looking at the plans of this mine and the adjacent Volunteer workings, it is seen that t levels in the West Volunteer bend away to the south from the line of the workings in the neig bouring mine. This appears to be due to a peculiar feature in the reef which it has required great deal of work to elucidate, but which seems now fairly well recognizable, viz.—that the lar Volunteer "formation," has sent off a branch to the south which has gradually made its way i solid country and very possibly dies out to the westward. In the lowest levels of the West Volunt the lode seems to pinch and become quite a small fracture in the rock, hardly at all faulting t country strata, becoming the small break seen in the West Extended Volunteer levels south of t shaft. Where it joins the main Volunteer lode, however, it becomes a strong reef and appears fault the strata. In the Volunteer workings it has been proved by numerous cross-cuts that t reef worked is only a vein on the foot-wall of a large "formation," often 20 to even 60 or more f wide. In the No. 6 level of the Volunteer a cross-cut almost on the boundary between the t mines has gone in over 70 feet a sort of hanging-wall is met with in this at 37 feet south of t reef worked in the level, and all the rock between is much shattered and disturbed. Even past t hanging-wall, which is a smooth friction plane dipping rather flatter than 1 in 1 to the south the count is still disturbed, and when I saw it there was no certainty that the true hanging-wall of the shatte zone forming the lode "formation" had been reached. In the No. 4 level of the Volunteer the go was found as usual on the foot-wall of the "formation"; but following this wall to the westward turned a little to the north, and the gold was lost. Later on, when gold had been worked nearly to t boundary by the West Volunteer, it was seen by the plans that the levels did not meet one another they might have been expected to do, and a cross-cut south was put in by the Volunteer Compa on the boundary, which cut the vein of gold-bearing stone worked in the neighbouring mine 32 f away from the foot-wall. Between the two there was curly slate, squeezed and contorted, a mullock, "formation" stuff in short. The Volunteer Company then worked the vein east, a came out on the level at the point where they had lost the gold. Here the gold-bearing stone h passed across the "formation" from the foot-wall to the hanging-wall. The West Volunteer go has all been on this lode, on the hanging-wall side of the main "formation." In this mine, ho ever, it appears to become quite a separate lode, the country between it and the foot-wall lo becoming less and less disturbed going westward. As remarked above, also, it becomes very sma and seems to be dying out. It would seem, therefore, that the great fracture in the earth formi the Volunteer "formation" has become wide at about the boundary between the two mines, a then thrown off a branch on the line of the hanging-wall, and broken back on to the foot-wa which is then a comparatively narrow fissure for some time, but widens out again to the lar "formations" seen in the Captain and Land o' Cakes mines. In the West Volunteer the foot-w branch is seen at No. 3 level in the chamber south of the old main shaft, and has been driven up to the westward. It is a distinct strong lode, but not gold-bearing at this point. The countr between it and the hanging-wall lode is a little disturbed in the No. 3 cross-cut, but very little in th one from the No. 4 level to the same foot-wall lode. Eastward, towards the junction of the lod in the Volunteer Mine, the intervening country becomes more and more shattered, and shows mo and more clearly the effects of the rock movements. The lode in the chamber at No. 3 level of th West Volunteer has been called the "Cadet" lode, and in the sense that the latter is probably a offshoot from the main Volunteer line, this may be fairly correctly said; but the present writer h no doubt whatever of its identity with the foot-wall stone of the Volunteer Mine and the so "formation" cut north of the West Extended Volunteer shaft at the bottom level. On th general plan of the district the line of lode is laid down, making due allowance for underlay, as would outcrop at surface, and the identity of these lodes is unmistakable.

The longitudinal section shows the ground stoped out by the West Volunteer Company, whic is practically all the known gold-bearing portion up to the present. The mine has unfortunate found the limits of this patch of good ore, and is prospecting for more. Owing to the fact that th gold-bearing hanging-wall lode will underlay out of the Company's hands into the Sectio immediately to the south, there is little inducement for the present owners to sink the shaft deepe and their best hope seems to lie in finding gold on the foot-wall lode, which is by no means impossib or unlikely.

The West Volunteer mine had crushed, up to the time of my leaving the District, 2589 to of quartz for 11,252 ozs. of standard gold, and had paid in dividends £22,750.

Volunteer Mine, Section 834-87G.—As explained above, this mine is upon a large "formation on the foot-wall of which is a more defined lode which has proved payably gold-bearing, and be stoped out as shown on the longitudinal section. In the first part of this Report it has be explained also that the quartz is often very thoroughly slickensided, and has at times been to asunder and dislocated by movements of the walls. The blank seen on the Section at No. 2 lev is probably owing to a fault in the reef itself due to such movements.

The No. 8 or 626 feet level shows in parts a nice lode, but there was little gold in it. Below this level the Company have put down a deep winze or underlay shaft for a distance now over 400 feet, and intend prospecting at low levels from it. The mine has a splendid record, having crushed, to 30th June, 1896, 10,486 tons of quartz for 27,754 ozs. 5 dwts. of gold, worth £109,092 1*s.* 11*d.*, from which dividends were paid in all £60,625. It is altogether improbable that the gold taken out is the whole amount in the reef, and I have no doubt that it will be found again if prospecting at lower levels is assiduously carried on.

East Volunteer, Section 811-87G.—This mine was worked many years ago under the name of the Shamrock, and yielded a good deal of gold. This gave out after a time, and the mine was abandoned. It will be seen from the section that the drive west at the bottom level of the Shamrock was almost upon the Volunteer chute of gold, and would have probably cut it if continued a short distance further. The East Volunteer Company have been very unlucky; they have done a large amount of prospecting along the reef, as shown on the plans and sections, but have got no gold. There is a large, often good-looking, reef on the foot-wall with a wide "formation" between it and the main hanging-wall, but on neither wall has any gold been found, and operations have been suspended.

In the present state of the mines on this Volunteer line, all down a considerable depth and all now requiring considerable capital for further development, it is advisable for the companies interested to agree to an amalgamation, by which all the mines might be tested in depth from one main shaft. The West Extended Volunteer shaft is the deepest, but, dealing now only with the properties of the West Extended Volunteer, West Volunteer, Volunteer, and East Volunteer Companies, the West Volunteer new shaft is the most central. It appears to me that a company to work all these mines in conjunction would be a first-class mining venture.

Adjutant Mine, Section 876-87G.—In this mine also the lode was a big "formation," with more defined lode-matter on the main walls. A rich little patch of gold was got at the upper level, from the northern shaft, but nothing more, and the mine was closed down after the work shown on the plans had been done. From these it is seen that this mine cannot yet be said to have been thoroughly tested.

Colonel Mine, Section 164-93G.—The lode is traced through this section by surface trenches, and a main shaft has been sunk as shown on the general plan of the District, but no work worth mentioning was done from it. It was put down 257 feet, and about 15 feet from the bottom cut a hard foot-wall. Above this "formation" material was passed through, so the lode appears here still to be a wide shattered zone.

Marshal Mine, Section 141-93G.—The workings of this mine consist of a main shaft and a smaller shaft, both of which were full of water when I saw them. A rubbly quartz lode is cut in the small shaft and in a trench to the north of the main shaft.

From this point the Volunteer reef appears to divide into two separate branches. The northern one is traced by trenches through Section 170-93G where shown on the general plan through the S.E. angle of 240-93G and S.W. angle of 220-93G, where there is a small shaft sunk by the Artillery P. A., and is cut in trenches again in Section 184-93G. It is said to have been cut again near the westernmost point of Broad's farm at the head of Back Creek. I did not learn that any gold had been got in any of these outcrops. The southern branch is seen in Section 575-93G where it has been cut by a number of shafts and trenches, but not, I believe, been proved gold-bearing. Two other small lodes shown on Section 575-93G on the general plan are probably connected with the main line. A little alluvial gold is found near these reefs, but so far as I could find they have not themselves been proved of any value.

Taking the Volunteer line of lode throughout its length, it is seen that the gold in it has been practically confined to the Volunteer and West Volunteer mines, but also that very few of the other mines upon it have opened any large extent of the reef. It is of interest, as bearing on the theory that the gold in Lefroy is confined to one narrow zone, to note that the Volunteer chute of ore is not nearly opposite the Land o' Cakes one in the adjacent and parallel lode, but, on the contrary, there is a long distance between them.

To the south of the south-eastern angle of Section 56-93G a small tunnel is shown on the general plan running somewhat east of south. This has been put in a distance of 250 feet, and has some seven small quartz veins from 1½ to 8 inches wide, running from N. 25° E. to N. 40° E., and some underlaying to the north, others to the south. Near the face there is another leader which might prove of more importance; it is from 6 to 12 inches wide, and runs N. 80° E., or on about the normal strike of the auriferous veins of the field. It is more like a lode in its character than the other leaders, but has not been driven along.

Corporal Shaft, Section 193-93G.—No work was in progress on this section when I visited it. There are several trenches about the ground, but I could see no reef in any of them. The shaft is about 40 feet deep. I could not see any lode-matter about it to show that a reef had been cut.

Bugler Reef, Section 153-93G.—This is a small reef on which but little work has been done further than trenching on surface. The main shaft is 127½ feet deep. It is the one farthest to the west on the general plan. The lowest level is at 115 feet; driving south the lode was cut 5 feet from the shaft, and the cross-cut was continued for 40 feet. At 72 feet there is another level, and the lode is followed for 30 feet to the east. At 60 feet there is another drive, and some stoping has been done to surface for from 30 to 40 feet east and about 35 feet west. Two prospecting shafts east of the main shaft are down 63 feet and 40 feet. The lode is a small one, but has been gold-bearing in parts, and is traceable eastwards into Section 146-93G.

West from the Bugler workings on about the line of this reef a shaft has been sunk some 50 feet or more, close to the Launceston road. No work was going on when I visited this, but I understand that a small vein of quartz has been found in it, which may be the Bugler reef; it was nothing of consequence.

North-east from this shaft a small tunnel, known as the Wealth of Nations tunnel, is shown on the general plan; it is not on a lode at all, but on a small sharp anticlinal bend in the strata, which gradually flattens out and becomes invisible.

Orlando Reef, Section 963-87G.—A little north of the Orlando main shaft shown on the general plan are two small old shafts, formerly known as the Rose and Thistle shafts, the former being the eastern one. Another old whim shaft is seen to the north-east. I have no particulars of the work done from these shafts or from the Orlando main shaft, which was not at work at the time of my survey. Some good gold has been got from this reef, the stone carrying also a good deal of stibnite. The creeks to the south of this reef carry some gold, and have been worked in places.

Enterprise Reef, Section 343-93G.—This is another small gold-bearing reef, formerly known as the Josephine, about which I have not been able to get definite particulars. The lode is cut by some fairly deep shafts and a tunnel, and some fairly good stone is stated to have been raised from it. The workings had been abandoned for some time when I visited the ground.

Wanderer and Londonderry Reef, Section 160-93G *and Eastward.*—This is also a gold-bearing lode, and in the Wanderer mine large lumps of auriferous stibnite were secured. The workings on Section 160-93G have long been shut down, but at the time of my visit a shaft was being sunk by the Londonderry Company on the north boundary of Section 238-93G, to the north of which the lode had been traced by trenching as shown on the general plan. The shaft was down 49 feet and driving was in progress, a cross-cut north being in 18 feet. Shortly afterwards I heard that a large mullocky "formation" had been cut, and that work was suspended on account of a heavy influx of water. This line of reef seems to be larger and stronger than any of the others south of the Volunteer line, and deserves to be tested more thoroughly. Really very little is yet known about it, but it has been gold-bearing in parts.

To the north and west of the north-west corner of Section 286-93G the general plan shows two small veins of quartz on which some trenching has been done. The more southerly workings are on a very small but fairly well defined vein, which has been very rich in places. About half a mile north-east from these workings another small lode has been cut and trenched upon by the Dean P. A., but I have not heard that any gold was got. These little lodes all may have some connection with the Wanderer or Enterprise lines, and the intervening country should be worth prospecting.

Vidette Reef.—In the south-east corner of the field several reefs are shown on the general plan in the vicinity of the old Native Industry mine. About half way between Sections 131-93G and 839-87G is the Vidette lode, on which several small shafts have been sunk. It is a fairly strong lode up to three feet thick, but no gold has been found in it that I could hear of. Alluvial gold has been found in the vicinity, one heavyish piece being got near the reef. I have already pointed out the reasons why alluvial gold in this field need not necessarily come from reefs close to where it is found, and in this instance there are traces of the old Back Creek lead for ten chains south of the Vidette line.

Native Industry Reef, now the *New Industry.*—Towards the south-east corner of Section 839-87G is the Native Industry main shaft, 200 feet deep, and west of it are a multitude of small shafts some pretty deep sunk to look for the reef. Very little work has been done for some years past on this reef. At 100 feet in the main shaft a drive went west for 75 feet, and also for some distance to the eastward. At the 180 feet level they drove west 40 feet, but the reef became narrow and poor. There is a whip-shaft about four chains west of the main shaft 75 feet deep from which a good deal of driving was done. Some crushings were raised from this shaft, one parcel of 15 cwt. giving 4 dwts. of gold. Another shaft about 4 chains further west is 90 feet deep, and has cross-cuts south at 30 feet, and north at the bottom level. About 26 chains west of the N.W. angle of Section 322-93G, the general plan shows a lode which has been uncovered for the distance shown, and which may be the Industry reef. It has not been proved to contain any gold.

Going eastward from the main shaft the Industry lode appears to be heaved to the north, and has been traced through the N.W. angle of 253-93G across the Piper road. The most easterly old shaft is said to have been 60 feet deep, and a good deal of work appears to have been done. The Sentinel G. M. Company were sinking a shaft on the reef on the west side of the road when I last visited the mine, and had some gold-bearing stone in a small reef underlaying south.

Sentinel Reef, Section 253-93G.—A very small but gold-bearing vein, which was in places very rich, has been worked upon a little where shown upon the plan. In the tunnel shown it was of no value. The main shaft is 84 feet deep with a level at 74 feet going 110 feet north to the above leader, which was then followed 22 feet east and 25 feet west, but was small and valueless. On the hill in the east of the section a stronger lode is seen in several old trenches, and in Section 399-93G an underlay shaft has been sunk on it 75 feet, following a wonderfully smooth slickensided wall. The quartz is about 6 to 12 inches in width, and of kindly appearance, but contains no gold. This reef has probably been cut to the south of the Sentinel main shaft in some trenches shown on the plan. It is a strong, well defined reef, but so far not gold-bearing.

Two more parallel veins of quartz have been cut by trenches near the north-east and south-east corners of Section 399-93G, but are not gold-bearing.

This vicinity will doubtless attract prospectors at all times, as there are reefs with the normal strike, and occasionally gold is to be found in them, and very probably some better discovery will in time be made.

Anderson's Reefs.—These are not shown on the plan, being considerably farther to the south-east, near the old Den alluvial field. They are worth referring to as showing that there are reefs still south of the Lefroy field, with very much the same strike, a consideration that may assist in explaining the amount of alluvial gold found about the Den, and also perhaps account for some of the gold in the Lefroy and Back Creek deep leads, which may well have taken their rise in former times in this vicinity.

The reefs are found on Crown Land to the west of John Anderson's and John Shepherd's purchased properties, and have been prospected mostly by Mr. Anderson. There are two lodes, traced by several pits and trenches for some 300 to 400 feet in length: they are nearly parallel, running from N. 53° E. to N. 68° E., and underlaying to the south. On the north lode a shaft has been sunk 63 feet, and at 57 feet a cross-cut was driven north 50 feet. On surface, in a deep cutting, the lode is seen to be about 2 feet thick of quartz, with broken country both above and below it, the thickness of the "formation" not being clearly seen. The lode appears to be a true fissure lode, with smooth walls. Very little, if any, gold has been seen in either lode, but some gold has been got about the surface, and as the reefs have the normal Lefroy strike, and are in good sandstone and slate country, they are worth testing more thoroughly than it has hitherto been practicable for the prospector to accomplish unaided.

Deep Cross-cutting of the Lefroy Field.—It has from time to time been proposed to prospect the Lefroy field at deep levels by a long cross-cut, at say 800 or 1000 feet, which would cut right across the field. With regard to this as a business proposition, I make no remark further than that it would probably be very difficult to reconcile the numerous interests of the various lease-holders whose land would have to be passed through, but from a purely mining point of view the scheme presents many admirable features. It would be a most excellent piece of prospecting, and might reveal other lodes whose existence is not yet suspected, and it would allow of drainage by a central pumping station down to the level of the cross-cut. The proposal is a large one, however, as it would require about two miles of cross-cutting. From the Chums lode to the New Native Youth reef, on a line connecting the deep shafts of the New Pinafore (central shaft) and New Native Youth, the distance is approximately 5000 feet, and from the Native Youth to the deep shaft of the West Extended Volunteer is in round numbers 6500 feet. A cross-cut on these lines would go through the best part of the field. The manner in which the lines of lode run parallel to one another across the field suggests some such scheme of deep-level cross-cutting as a natural and obvious consequence.

Conclusion.

In concluding this Report, I have again to regret that the circumstances under which it has been written have prevented me from completing plans of all the mines and describing the special features of each in detail. A large mass of data, collected with much trouble and expense of time, has had to be reduced to the smallest possible digest instead of being given in full, and there has been no possibility of looking up old records to get full particulars of old workings. One object of the survey was to acquire all the information possible about workings now closed down, in order that it might be put on an easily accessible record for future use. Every year it becomes more and more difficult to learn exactly what has been done and found in old abandoned mines, and such are often re-opened after the lapse of years on the strength of fables as to what had been

in them. The above account of the field shows how much information is still required can be a really thorough history of Lefroy mining, and I would suggest to persons int district who are able to give particulars which I have been unable to gather, that tl doing a good work for the district if they would note them down and send them to the for record.

Just at present the Lefroy field is in a state of great depression, and has fallen estimation on account of the failure of the principal mines to get gold; but this has ha in the history of this field, as in that of many others, and things will doubtless take a better again. The great want of the mines is now capital for extensive prospecting a and it can be truly said that there are few prospecting ventures that promise better fo does the development of this field in depth. The gold will doubtless be found again i as in others elsewhere that have passed through the same experience, and the record c good enough to warrant very sanguine hopes for its future when the lodes are more th extensively laid open from deep shafts.

In the course of my survey it was necessary to ask a great many people to put some trouble to give information, and show me various features of the field, and I hav saying that everyone was most anxious and ready to give all assistance.

I have the honor to be,
Sir,
Your obedient Servant,

A. MONTGOMERY,
Late Geologica

The Secretary for Mines, Hobart.

REPORT ON THE SCAMANDER MINING DISTRICT IN APRIL, 1897.

Mines Office, Launceston, 15th May, 1897.

SIR,

I HAVE the honor to submit the following Report of an examination made of the Mining Field in the vicinity of the Scamander River, in pursuance of your instructions.

The principal rocks of the district consist of slates and sandstones, frequently a good deal metamorphosed. No fossil evidence has, so far as I am aware, been found to prove their age, but they probably belong to the Lower Silurian series. Their general strike is approximately parallel to the Scamander Range, *i.e.* N. and S., and they dip at high angles to the west. Close to the Scamander Bridge they are penetrated by a belt of granite, which forms an anticlinal ridge, the sedimentary rocks dipping in opposite directions on either side. For some miles north and south along the coast they are overlain by Marine Tertiaries, which are also seen in isolated patches in other parts.

The mines may be roughly divided into two groups, viz., those in the igneous rocks, as the old Scamander and Beulah Mines, and those in the sedimentary rocks, including the Eastern Proprietary and Yarmouth Mines; but it is noticeable that whereas the lodes in the Eastern Proprietary and adjacent properties have a general strike of north west and dip to the south west, the Yarmouth lodes strike about north east and dip slightly to the south east.

The only properties on which any work was being done at the time of my visit were those of the Eastern Proprietary Copper and Silver Mining Company and the Beulah Silver Mining Company, and at the latter only by tributors.

The former company holds an extensive property consisting of ten sections, 233-93M, 232-93M, 57-93M, 56-93M, 370-93M, 228-93M, 229-93M, 230-93M, and 564-93M, which extend in a north-westerly direction from a point near the head of the right or East Arm of the Scamander River, distant by the river about five miles from the bridge. The total area is 474 acres, 160 acres of which, contained in Sections 56-93M and 57-93M, are held as reward claims for copper. The outcrop of the main lode can be traced with few breaks for over two miles in a north-westerly direction from the most southerly block, and consists chiefly of siliceous ferruginous matter showing no copper-bearing minerals to the naked eye, though I believe traces of copper can generally be obtained by analysis. In Section 57-93M a tunnel was driven 43 feet in a south-easterly direction in gossan assaying fairly well for silver, but with little or no copper, but, copper and iron pyrites and blende were obtained from a small prospecting shaft 15 feet deep sunk a little below the tunnel; this shaft is now full of water.

The main workings are on Section 56-93M, where a long tunnel has been driven along the lode, starting on the north side of a large creek running through the section in a north-easterly direction.

The outcrop forms the crest of a ridge which rises some 600 feet above the level of the tunnel; and at a point in Section 229-93M about 500 feet above the mouth of the tunnel there is a strong outcrop cutting the main lode at an angle of about 45 degrees, but apparently without faulting it.

The point of intersection of the two lodes is, approximately, 40 chains horizontally from the mouth of the tunnel. The tunnel, starting at a point about 130 feet above sea level, has been driven a distance of 870 feet in a general north-westerly direction, and several good shoots of ore, apparently dipping south, have been passed through. In the back of the tunnel the ores are mostly oxidised, consisting of earthy black and red oxides and blue and green carbonates of copper, but underfoot copper glance predominates, and this with copper pyrites will probably be the principal ore below the water level. Copper glance or chalcocite when pure consists of 79·8 per cent. copper and 20·2 per cent. sulphur, but usually contains one or two per cent. of iron. The lode is a very wide one, and the necessary precaution has been taken of driving cross-cuts at intervals of 50 to 100 feet, which prove the lode formation to be from 20 to 40 feet wide, and some promising veins have been cut carrying carbonates, oxides, and sulphides of copper. The bulk of the formation consists of slaty lode-matter much kaolinised, yielding a small per-centage of copper, but, from the nature of the ores at this level, it does not admit of concentration.

At 440 feet from the entrance a strong body of ore was cut about 8 feet wide carrying copper-glance and tile ore (mixed oxides of copper and iron), and a winze was sunk to a depth of 85 feet, which at the time of my visit was full of water to within about 12 feet of the tunnel

level. Mr. Cameron, the mine manager, informed me that cross-cuts had been driven at 80 feet, 15 feet W., and 19 feet E. in lode-matter all the way, but as the water became too heavy for baling an opening was made at 47 feet and cross-cuts at this depth showed the lode to be 39 feet wide. A drive was also put in south along the lode, and the ore stoped out to within a few feet of the tunnel.

From this stope and from the ore obtained in driving the tunnel, about 120 tons of hand-picked ore were sent away, returning an average of 28 per cent. copper and 17 ozs. silver per ton. There are also about 300 tons of second-class ore at grass, which appear to have been very carefully sampled, and assayed from 10 to 15 per cent. copper and 10 ozs. silver per ton.

A few feet beyond the winze a rise was started to connect with the surface in about 200 feet for air. This was put up 136 feet. For the last 80 feet it carried little or no copper, and, as the air in the end remains good, it has been discontinued for the present.

The last cross-cuts were at 832 feet from the entrance, 24 feet east and 10 feet west, through slaty lode-matter impregnated with iron pyrites. The face at present shows similar material, with a good deal of kaolin, and on the hanging-wall is a thin vein carrying black oxide of copper. Some 45 feet ahead of the present face, crystals of chloro-bromide of silver (embolite) are said to have been found in a trench on the surface, and the intention is to extend the tunnel under this point in the hopes of meeting a rich shoot of ore.

On the whole the prospects disclosed by the tunnel working are decidedly encouraging, but it is certain that before the mine can hope to produce regular supplies of ore, a main shaft will have to be sunk and equipped with machinery. A rough cart-road has been made from the tunnel to the landing at the head of the East Arm of the Scamander, and from here the ore hitherto sent away has been taken down to the bridge in boats: this necessitates a lot of re-handling, and eventually a good cart-road or tramway will have to be made to connect with the main road.

The other work done on this property consists in a few trenches across the outcrops of two parallel lodes in Section 370-93M, exposing some very promising looking gossan. One of these outcrops can be traced on to the adjoining Section 341-93M, locally known as Loane's Section, where a tunnel has been driven on the lode for about 100 feet in a north-westerly direction through alternate bands of slate and sandstone striking north and south. In the face of the tunnel there is a foot of good-looking gossan, with a bunch of ore consisting principally of arsenate of iron with a little copper pyrites. At the entrance to the tunnel a shaft was sunk about 25 feet, but it was full of water, and I could not learn what the lode was like in the bottom. The lode has been cut again in several trenches higher up the hill, and in one of these, about 80 feet above the tunnel level, shows about one foot wide with well defined walls standing almost vertical and striking north-west. A sample from here assayed by Mr. Ward, Government Analyst, yielded 2·2 per cent. copper, 1 dwt. 15 grs. gold, and 8 ozs. 9 dwts. 20 grs. silver per ton.

Another strong gossany outcrop was seen on this Section, but no work has been done on it.

Further north, on what is known as Cramp's Section, a shaft has been sunk 100 feet, but it was inaccessible owing to water and bad air. So far as I could learn, no driving has been done from the bottom, but the ore on the top shows copper and iron pyrites, with stains of blue and green carbonates of copper.

North Scamander.—This Company holds Sections 718-93M and 719-93M, situated to the south of the Eastern Proprietary tunnel. The only lode on which any work has been done, so far as I saw, was one exposed in the bed of a creek running in a deep rugged gully through Section 719-93M. A shaft, which I was informed was 25 feet deep, was full of water at the time of my visit, as were also one or two trenches, and it was impossible to tell accurately the strike or width of the lode, which is evidently a very strong one. The ore at surface shows a dense mixture of blende, pyrites, and galena, with bunches of fairly pure copper pyrites and strings of clean galena. In places there is a good deal of pyrrholite or magnetic pyrites, which had a sensible influence on the needle. The gangue is very hard and siliceous, and the lode-filling does not seem to be much oxidised or leached. A sample which I took of some of the blende and pyrites returned 6 per cent. of copper, 1dwt. 15grs. of gold, and 5ozs. 15dwts. 12grs. silver per ton. This lode seems well worth further prospecting, but water is likely to prove troublesome. As, however, the ore is so little oxidised, a tunnel might be driven with advantage.

On Section 353-93M a very strong outcrop is seen, and several trenches have been cut across it, in one of which I noticed a siliceous gossan formation about 6 feet wide. The outcrop can be traced to the top of the ridge about 530 feet above sea level. This hill offers very good facilities for tunnelling along the lode, though it is probable that here, as in the Eastern Proprietary, the oxidised zone will extend to a considerable depth.

Several other similar outcrops were seen on the adjacent sections, and there is evidently a wide belt of country traversed by a series of parallel lodes which, from the results obtained in the Eastern

Proprietary Mine, seem worth further prospecting. It is all open country, easily accessible, with an abundant supply of good timber.

The old Scamander Mine is situated on private property, about a quarter of a mile above the Scamander Bridge on the south side of the river. It was started more than 11 years, and some high grade ore was obtained assaying up to nearly 200 ozs. silver and 9 dwts. of gold per ton, but it proved very refractory, and the mine being situated so close to the river, the water was heavy. A tunnel was driven about 200 feet to the contact of the igneous and sedimentary rocks, and several veins of quartz were cut which are said to have yielded rich silver ores.

An underlay shaft was sunk near the entrance of the tunnel, and higher up the hill a main engine shaft was sunk 130 feet deep, but these were both inacessible owing to water. The ore at grass shows principally crystalline arsenical and iron pyrites, zinc blende with a little galena and copper pyrites in a quartzose matrix.

On the north side of the river, about three-quarters of a mile from the bridge, are situated the Beulah, South Beulah, and Scamander Bell mines. The granite has here weathered *in situ* to a very considerable depth, but in places large kernels of undecomposed granite are met with, surrounded by decayed rock.

On the Beulah (Section 371–93M, 80 acres), two lodes have been worked from a series of shallow shafts and trenches, and in one place on the No. 2 or east lode a length of about two chains was stoped to the surface from a depth of about 40 ft. The lodes consist of iron-stained quartz, the silver being chiefly in the form of chloride in cavities in the quartz. Where the quartz is more solid a good deal of pyrites occurs which is also said to assay well for silver and gold. The lodes vary in thickness from a few inches up to a foot, and as exposed in the upper workings seem to be striking a little east of north, and dip at angles of about 45° to the east, but they are somewhat erratic. No. 2 lode is about 200 ft. east of No. 1, and about 200 ft. east of No. 2 a main shaft was sunk to a depth of 110 ft. At this depth water was struck, but only rose a few feet, and at 100 ft. a cross-cut was started and driven 134 ft. west, but was discontinued after meeting some hard granite "boulders" without cutting the lode. Except where these solid kernels occur, the ground is very soft, as may be judged from the fact that the main shaft, which is 9 ft. by 3 ft. 3 in. in the clear, was sunk for 14*s.* 6*d.* per ft., and the cross-cut driven for 7*s.* 6*d.* per ft., and it is a pity that this cross-cut was not continued. At present the mine is in the hands of tributors, who are burrowing out the more easily accessible parts up to about 40 ft. in depth. Since the beginning of 1896 about 51 tons of ore have been sent away, the average assays from which were 92½ ozs. silver per ton, one lot of 6 cwt. going as high as 241 ozs. For these figures I am indebted to Mr. Gaunt, the Legal Manager of the Company.

On the South Beulah (Section 648-93M, 40 acres) several shafts were sunk some years ago, but very little driving was done. To the east of the Beulah are two Sections, 933-93M and 934-93M, belonging to the Scamander Bell Company. A small vein of quartz and gossan is exposed in a trench, from which I broke specimens showing chloride of silver. A shaft was sunk 60 feet last year and a cross-cut driven 20 feet west, but not far enough to cut the lode. Large "boulders" of undecomposed granite were encountered in sinking this shaft, considerably increasing the cost. The ore bodies at present exposed in these mines are small and patchy, and unless larger lodes are discovered by cross-cutting they will not pay to work when the solid granite is reached.

Some three miles to the north of the Beulah is the property of the Yarmouth Proprietary Company, which holds Sections 743-93M and 744-93M of 40 acres. A creek runs through the centre of the sections from west to east, in the bed of which three lodes have been cut running about north east. On what is known as No. 1 lode (the centre one of the three) a shaft was sunk close to the creek (which has been here diverted for some chains in length). This shaft is 37 feet deep, and an opening was made at 32 feet and a drive put in north east about 20 feet, the lode in the end being full width of the drive, but the water was too strong to cope with the windlass, and driving was discontinued. These particulars I obtained from Mr. Brooks, the late mining manager, as the shaft was full of water at the time of my visit. The stone at grass shows a highly siliceous matrix, carrying a large proportion of crystalline arsenical pyrites with strings and splashes of galena and copper pyrites, picked samples from which have assayed up to 14 dwts. gold and 40 ozs. silver per ton.

This lode has also been cut in a trench on the north side of the creek, and shows about six inches of gossan, samples from which, Mr. Brooks informs me, had assayed 3 dwts. gold and 9 ozs. silver per ton.

About two chains higher up the creek No. 2 lode has been cut in several trenches, and, as far as could be seen, is about two feet wide, carrying arsenical pyrites and a little copper pyrites with stains of malachite. A sample which I took from here yielded 1 dwt. 15 grs. gold, 2 ozs. 15 dwts. 12 grs. silver per ton, and 3·5 per cent. copper.

What is known as No. 3 lode is east of No. 2, but sufficient work has not been done to determine its strike or dip. A few pieces shot from the capping show an intensely siliceous matrix, in which I noticed a little pyrites and blende. The country rock consists of slates and sandstones, in some places much indurated and altered to quartzite.

On this and the adjoining sections several other outcrops were seen similar to those near the Eastern Proprietary, but no work worth mentioning has been done on them. These properties are very easily accessible, the Yarmouth Mine heing only about half a mile from the main road, about 8 miles from St. Helen's.

I also paid a hurried visit to the Silver Echo Mine, which, though not exactly in the Scamander District, is apparently on the same belt of country as the Eastern Proprietary Mine. It is situated to the north of Constable's Creek, about five miles from the town of St. Helen's. This property has been taken up at different times for tin, gold, and silver, but very little work was done until it came into the hands of the present holders, Messrs. H. Grant and party, of St. Helen's, who have shown their faith in it by the work they have done.

The workings are situated on Section 330-93M, at about 350 feet above sea-level. A creek with steep hills on either side runs through the section from south to north, and along the bed of this a trench about six feet wide and four feet deep has been cut in a southerly direction for forty feet through a big quartz outcrop, which I judged to be about thirty feet thick. The quartz again outcrops some distance up the hill on the west of the creek, and its strike is apparently about thirty degrees east of north. At a height of 750 feet above sea-level, or 400 feet above lode in the creek, on the eastern spur another outcrop of a gossany character is seen striking north west towards the present workings, and, Mr. Grant informed me, could be traced south east as far as Constable's Creek—about a mile and a half away. In the hope of cutting this lode a tunnel was started from the end of the trench and driven a total distance of 161 feet. In places the cleavages and joints in the schists show scales of native copper, but the lode was not cut, and it is probable that the junction is further north. Close to the mouth of the tunnel a shaft was sunk about fifteen feet on a large body of pyrrholite, which Mr. Grant informed me was giving way to cupriferous iron pyrites in the bottom. A sample I took of the pyrrholite gave traces of gold and silver and 0·1 per cent. copper. The main mass of this magnetic pyrites, though attractable by the magnet when powdered, does not affect the compass needle, but at one place there is a very decided deflection, the needle pointing due south. In the quartz are several small veins carrying black and red oxides of copper, and there is one vein about a foot wide of iron pyrites containing a little copper, a sample from which gave traces of gold and silver and 0·3 per cent. copper.

The ore as at present exposed is mostly of low grade, but, with such a big formation, there is much encouragement for further prospecting by driving along and cross-cutting the lode in the hope of meeting richer veins and shoots of ore. The country rocks are similar to those in the neighbourhood of the Eastern Proprietary Mine, and I noticed several indications of gossan outcrops.

I have, &c.

J. HARCOURT SMITH, *B.A.*,
Geological Surveyor.

The Secretary for Mines, Hobart.

EPORT ON THE MINERAL DISTRICT BETWEEN CORINNA AND WARATAH.

Mines Office, Launceston, July 25th, 1897.

IR,

I HAVE the honour to present the following preliminary Report of an examination of the ineral district between Corinna and Waratah. The time at my disposal was much too short to low of anything but a very hurried examination of such an extensive belt of country, and, as in a reat many cases no work was going on, and most of the shafts were full of water, it was quite npossible to form a correct estimate of the prospective values of the different properties; this Report ill therefore only deal with the district in a cursory way, and I hope to be able to make a more xtended examination at some future date.

All the hydraulic sluicing companies formed to work the extensive deposits of auriferous gravel i the neighbourhood of Corinna have ceased sluicing operations, and I did not examine any of these roperties. A good deal of money has been spent in constructing water-races, &c., and as far I could idge in passing, a fair trial of the wash appears to have been made, but the results were very isappointing. At several of these claims one or two men are utilising the water brought in by the ompanies, but I could not hear of any of them getting much gold.

Arriving at Corinna on the evening of the 19th of May, I went next morning to see the avage River mine, which is best reached by going down the Pieman by boat for about two miles nd thence by track some two miles inland. The Savage River Company was originally formed as hydraulic sluicing company to work some of the alluvial terraces of the Savage River, but their perations were not successful, and attention is now being directed to underground prospecting. Two unnels have been driven in a W.N.W direction. The lower one, at an elevation of about 150 feet bove sea level, is over 300 feet long; it passes through some feet of gravel into soft decomposed lates. Two small veins carrying oxides of iron and manganese were cut, which might contain ilver and copper, but I do not know if they have been tried. On the hill above the tunnel there re some large boulders of gossan, but nothing corresponding to these was met with in the tunnel, nd it seems probable that they have come from some formation higher up the hill. No. 2 tunnel, 5 feet above No. 1, is 45 feet long, the country being similar to No. 1, with bands of quartzite. Native copper is said to have been found in the joints of the country in this tunnel, but I could not e any. Several small shafts have been sunk through the gravel up to 20 feet in depth, but I have o information as to the quality of the "wash." The prospects of this mine, as far as I could see, e not very encouraging, though it is quite possible that there may be other surface indications hich I did not see.

Lucy Spur.—From the Nancy Landing, some four miles above Corinna, a track leads to the ucy Spur, passing by the old Frenchman's Peak Hydraulic Company's workings.

The Lucy Spur Company spent a large sum in bringing in a water-race fifteen miles long from e Rocky River, and a good deal of sluicing was done. Some rich patches of gravel were found, it were of very limited extent, and the bulk of the wash did not prove payable. The company as a couple of men working in the southern portion of the property, about S.S.E. from the old orkings, and they are at present driving a small prospecting tunnel through soft sandstone striking orth and south, and underlaying to the east. Eighty feet above this another tunnel has been driven 15 ft., in which several veins of rubbly quartz, containing copper pyrites and red and brown xides of iron, were cut, which give very fair prospects of fine gold. These quartz veins occur in hat is probably the capping of a quartz porphyry dyke, containing gold more or less through its ntire width of about 38 ft., but not in payable quantities. These workings are on the eastern side the ridge which runs through the property a little to the west of north. Good gold has been btained from the creek on the eastern side, and from another creek running to the west good gold said to have been obtained up to where it cuts through the spur, to the north of the present orkings. The lower tunnel is about 220 ft. below the Lucy Spur water-race, which is said to ntain from 35 to 40 sluice-heads, so that ample power for crushing purposes would be available if yable gold were struck.

From the Lucy Spur it is about six miles to the Rocky River, which is crossed a short distance ove its junction with the Whyte River. The largest gold nuggets yet found in Tasmania—one eighing 243 ounces—were obtained in the bed of the Rocky River a short distance above the nction, and good gold has also been obtained from the Whyte River. A little above the junction e latter makes two sharp bends, forming a loop, and a scheme was mooted some years ago to drive tunnel through the narrow ridge known as the "razor-back," and thus lay bare the bed of the river r about three-quarters of a mile, but nothing came of it.

The Rocky River Gold Mining Company.—Hold Sections 34-94, 35-94, 36-94, of 10 acres and Section 61-95 of 9 acres, situated between the Whyte and Rocky Rivers. The principal workings are about a quarter of a mile above the suspension bridge over the Whyte River, which here runs nearly west. No. 1 tunnel, between 140 and 150 feet above the river, was driven 340 feet, bearing south 35° east, and at 108 feet a cross-cut was put in over a hundred feet to the west without cutting anything of any value. From the end of the tunnel a cross-cut was driven to the east, and at 45 feet No. 1 lode was cut, striking a little west of north; this was driven on 30 feet south and 8 feet north, the lode in the south end being about 3 feet wide, consisting chiefly of magnetite and iron pyrites; in the north end the lode is broken and poor. At 90 feet from the flat sheet No. 2 lode was cut and driven on 4 feet north and 86 feet south, the ore in the north end being about 18 inches, and in the south end 3 feet wide, very similar to No. 1 lode. The cross-cut was continued to 360 feet without cutting any further ore bodies. The main country rock consists of hornblende, talcose, and other crystalline schists striking nearly north and south and dipping at high angles to the east, but in the cross-cut to the east of the lodes a hard belt of hornblende gneiss was cut.

No. 2 tunnel, about 120 feet below No. 1, is 228 feet long, with several bends. At 105 feet a small formation was cut, which on driving south opened out considerably, and is probably identical with No. 1 lode cut in the upper tunnel. As is usual with deposits of this kind, the ore appears to occur in lenticular masses. At 210 feet it had widened to about 8 feet, and at the time of my visit a winze was being sunk, but was only a few feet below the floor of the tunnel. The ore is very similar to what is seen in the upper tunnel, but contains more copper pyrites, and black oxide of copper is also said to have been found. In places there is a great deal of calcite disseminated through the ore, and veins of calcite carrying bunches of clean copper pyrites are occasionally met with. In the face, as I saw it 264 feet from the flat sheet, there was about 6 inches of calcite and pyrites on the footwall and on the hanging-wall, the dark green schist was strongly impregnated with iron pyrites in elongated particles with polished surfaces, pointing to great pressure and shearing action since they were deposited. One sample from this tunnel is said to have yielded 1 oz. 15 dwts. gold per ton, 7 ozs. silver, and 5 per cent. copper, and a sample of 56 lbs. to have yielded at the rate of 18 dwts. gold per ton, but, to arrive at any estimate of the value of the property, systematic sampling and assaying is absolutely necessary. It is probable that rich secondary bunches of ore may be met with, but the success of the mine must depend on the value of the bulk of the ore.

On the top of the ridge, 370 feet above the river, is a strong outcrop of magnetic iron. On the southern slope, 100 feet below the outcrop, a tunnel has been driven 102 feet in an easterly direction, the last 18 feet being through a gossan formation containing brown hematite, magnetite, and a little oxide of copper. This has a promising appearance, and could be easily prospected by a tunnel at a deeper level towards the Rocky River.

At present it costs five pounds (£5) per ton to pack ore from the mine to Corinna, but it should be done for very much less, although the first part of the track is certainly very steep, and in a terrible state. I hear that steps are about to be taken to construct a tramway down the Whyte River to some convenient point on the Pieman. This is the natural outlet for the district, and it is a great pity that the entrance to the river is such a dangerous one. It is a splendid river, and once over the bar there is deep water for some miles beyond Corinna. Before constructing the tramway it would be advisable to send away a parcel of ten to twenty tons, to find out what the ore already exposed is likely to realise in bulk.

To the north east of the Rocky River Company's workings on Section 47-95, known as Hacket's Section, a formation has been cut carrying iron pyrites and a little copper pyrites associated with magnetite, hematite, quartz asbestos in hornblende schist. A shaft about 10 feet deep has been sunk on the formation, which is about 4 feet wide at the top and about 2 feet in the bottom. A prospecting tunnel is being driven to intersect it at a depth of about 40 feet, and at the time of my visit the schist in the end was impregnated with pyrites, and a few feet more driving should prove what the lode is like at this level. From the mouth of the tunnel the ground falls rapidly to the Whyte River, offering splendid facilities for testing at a lower level should the prospects revealed by the present tunnel warrant it.

From the suspension bridge over the Whyte River the track is very rough and steep to the junction with the Corinna Road on Brown's Plains, the rise being about 750 feet in a mile and a half. Between the eight and the nine mile pegs from Corinna the ironstone formation is seen outcropping on the road, and on Section 886-93M some work was done several years ago by the South Savage River Company. Several trenches have been cut, exposing a strong formation consisting chiefly of magnetic and other oxides of iron, the country being metamorphic crystalline schists similar to those at the Rocky River. A shaft, now full of water, was sunk 60 feet, the ore at surface consisting of magnetite with a good deal of pyrites, talc, and asbestos, but I have no information as to assay values. The country is here covered with bauera and horizontal scrub, and a good deal of time was lost in unsuccessfully looking for another large pyrites formation said to have been cut lower down the creek.

To the east of the South Savage are situated two sections, 1077-93M and 1078-93M, in the mes of Heaps and Simson. What is known as the Nine Mile Creek runs through the sections, id in working up the bed of this for gold a formation carrying copper pyrites was cut. A shaft as started close by the bed of the creek, but after sinking 30 feet the water became too strong. his shaft had been baled to a depth of about 16 feet from the surface at the time of my visit, and n examination of it showed a quartz formation about 3 feet wide carrying a little copper pyrites nd carbonate of iron at the top, while just above the level of the water there is about 18 inches of irly solid copper pyrites, samples from which are said to have given 28 per cent. copper, 8 dwts. old, and 10 ozs. silver per ton. The course of the lode is apparently N. 20° W., the underlay at the p being to the west, but in the bottom it is said to be to the east towards the creek. Lower down he creek another shaft was sunk and a crosscut started for the lode, but work was suspended before he lode was cut. No work was being done on this property, but the prospects are such as to deserve rther attention. An effort should be made to trace the course of the lode by trenching: if, as eems probable, it is running parallel to the creek, water will prove very troublesome, and as the hills n either side are very steep it will be difficult to divert the course of the creek. The rise from the haft to the Corinna Road is 660 feet in about a mile. From this point the road was followed to the 6 mile-peg on Long Plains, and in about a mile from the turn-off Weetman and Crockford's was eached. The two sections formerly held by this company, 2–85 and 3–85, of 15 acres each, held in he name of H. H. Gill, were originally granted as reward claims for gold. The spur on which the orkings are situated runs about N. 10° E., and is covered with quartz gravel of varying depths, from hich altogether about 500 ozs. of coarse crystalline gold have been obtained. On the west side of the idge three tunnels were driven and connected by winzes on a very flat quartz vein 6 to 12 inches ide crossing the country and running approximately east and west. In the rise from No. 2 to No. 1 tunnel some very rich patches are said to have been obtained, and a little underhand stoping as done below No. 2 level, but I could not ascertain how much gold had been obtained. In No. 3 nnel the rich shoot was also cut, and a winze sunk on it, (now full of water). The country rocks re metamorphic schists and slates, striking about north and south, and in No. 2 tunnel several small uartz veins have been cut running parallel with the country, and a good deal of driving has been one, but so far as I could learn very little gold had been found. It is very unlikely that the rich hoot referred to above on the cross vein is the only one it contains, and it is hard to understand why nore prospecting has not been done on this.

On the east side of the hill Messrs. Batty and M'Grath have cut a deep trench about 90 feet ong, and from the end a small drive has been put in north and south. The country is much roken, and traversed by small quartz stringers carrying a little gold.

All the creeks in the vicinity of Long Plains carry more or less gold. It is very difficult to btain accurate information as to the amount that has been actually obtained, but I have been nformed on good authority that between twenty and thirty thousand ounces have been obtained rom Main Creek and its affluents,—Grey's, Riley's, Big and Little Duffer, Big and Little Smith's nd Townsend's Creeks, and there are still a few men fossicking. In Big Duffer Creek, about 200 ards above its junction with Little Duffer Creek, on Section 113-95, in the name of Shore & Sykes, formation has been cut showing copper pyrites, zinc blende, and quartz, but no work has been one on it beyond putting in a shot in the capping. Its apparent strike is a little east of north, nderlaying to the east. To the north of Weetman and Crockford's, in Riley's Creek, a quartz rmation about 10 feet wide, carrying a good deal of iron pyrites, has been cut, which seems well orth further prospecting. A good many sections have been pegged for gold in this locality, but he only mining work that I saw was on what was formerly, I believe, known as the Stanley Com- any's property, Sections 56-94 and 104-95. A prospecting tunnel has been driven about 300 feet, nd several small veins of quartz, with oxides of iron and manganese, have been cut, which look ather promising, but no driving has been done on them, and I do not know if they contain any- hing of value.

After crossing Main Creek the track rises to what is known as O'Brien's Terrace, where deep old-bearing wash has been found at an elevation of about 1150 feet above sea level. Several hafts have been sunk, one of which is said to be 80 feet deep, and the bottom was not reached. ood prospects were, I believe, obtained from the wash, but the difficulty of obtaining a supply of ater for sluicing prevented much work being done.

From here the Badger Plains track was followed to the Clarendon, Section 792-93M, 80 acres. n this section a tunnel was driven 400 feet in an easterly direction, but at the time of my visit is was blocked about 200 feet from the entrance, the ground having come away from the back. he first 50 feet are through soft decomposed whitish schist, succeeded by dark green actinolite schist npregnated with pyrites, with occasional bunches of magnetite, and showing in places stains of rbonate of copper. A belt of serpentine rock with veins of asbestos was also passed through, it I was unable to determine its relation to the crystalline schists. The ore at the mouth of the nnel is principally magnetite and pyrites. Some high assays for gold are said to have been tained from here, and the property deserves further attention.

The Rio Tinto Mining Company's property lies to the north-east of the Clarendon, and comprises in all 330 acres, included in sections 177, 178, 179, 180, 268 and 274-93M. No work was being done at the time of my visit, but Mr. Thorne, the mine manager, kindly showed me over the old workings. Two formations have been discovered on the property, the westerly one, known as No. 1 lode, being probably a continuation of that cut in the Clarendon, the outcrop of magnetic iron being traceable nearly all the way, and for some miles further to the north-east.

The Savage River cuts through the formations, and on No. 1 lode two tunnels have been driven on the north side of the river, and one on the south. Nos. 1 and 2 tunnels are situated close together, about quarter of a mile below the bridge on the old Specimen Reef track across the Savage River. By the bridge there is a belt of magnesian limestone or dolomite, which is succeeded by a fine-grained greenstone with minute granules of pyrites and magnetite disseminated through it, which is doubtfully classed as diorite. This continues as far as No. 2 tunnel, which has been driven 114 ft. about N.E., and from the end a crosscut put in 40 ft. to the N.W. The main mass appears to be magnetite and cupriferous pyrites with occasional veins of asbestos, but there is no defined boundary between the ore and the country rock. In places where water is oozing out, the walls of the drive are stained with incrustations of sulphate and carbonate of copper. No. 1 tunnel, a little to the west of No. 2, has a total length of 184 ft. through similar matter to No. 2. These tunnels were driven by the old Huzza Company, and were probably considered to be on the walls of the lode, as the greenstone again appears to the west of No. 1. A cut has, however, been taken along the hill and two more ore bodies cut, separated by a narrow belt of greenstone. The more westerly one shows about 50 ft. of magnetite and pyrites, the latter occurring mixed with the magnetite and also in veins. To the north the hill rises abruptly, and should the ore prove payable in bulk an immense quantity would be available, but systematic assaying is absolutely necessary to form any adequate idea of its value. On the south side of the river, a little to the west of Nos. 1 and 2 tunnels, is No. 3, which was driven 178 ft. bearing about S.W., the ore being similar to that on the other side, but its width is unknown. No. 4 tunnel was driven by the present company from a point on Hall's Creek about half a mile above its junction with the Savage River. It is driven across the country, bearing a little S. of E., and is in 172 ft. Ore was first met with at 147 ft., and a few feet further ahead is a small vein of copper pyrites. From here to the face the country, consisting chiefly of actinolite schist, is much disturbed with magnetite and pyrites disseminated through it. The main mass of the deposit is probably not far ahead, and it would be advisable to continue this cross-cut right across the formation, taking samples for assay every few feet. In this way a fair idea could be formed of the average value of the ore. The means of access to this property are very poor, but there are exceptionally good natural facilities for cheap working, and if it could be proved that the ore would yield a small profit per ton by being treated on the spot, there would be a great future before the district. Immense deposits of magnetite are of frequent occurrence in the crystalline schists in other parts of the world, especially in Norway and Sweden and the United States, but their origin, and indeed the origin of the crystalline schists themselves, is a much disputed point.

No. 2 lode lies some distance to the east of No. 1, and has a strong outcrop of red and brown oxides of iron. A tunnel has been driven 386 feet in a S.W. direction along its course. At 177 feet a winze was sunk about 17 feet through gossan, and a cross-cut to the west at this point shows the lode to be about 17 feet wide containing promising looking gossan with a little native copper and black and red oxides of copper showing in some of the vughs. A rise was also put up 80 feet, and at 50 feet up a cross-cut was driven through oxidised lode-matter similar to that seen in the level. At 266 feet there is apparently a fault in the lode, and the slide has been followed for some distance, but only small veins of carbonate of iron were met with. This lode seems worth further prospecting.

North of the Rio Tinto blocks are two sections in the name of W. W. Stewart, on which no work has been done so far as I know. The outcrop here forms the crest of the ridge, the highest point of which, close to the boundary between Stewart's and Thorne's section, is about 750 feet above the bridge over the Savage River. The ground here falls very rapidly to the west towards Hall's Creek, and offers splendid facilities for cross-cutting at low levels. Further north on Section 650-93M, in the name of J. H. Thorne, a tunnel has been driven from the west side of the ridge in a direction a little S. of E. for a distance of 220 feet. Two large gossan formations were cut, separted by a belt of soft decomposed schists. Twenty-three feet from the end native copper was met with through the country and eight feet further is a vugh showing native copper and specular iron. The last ten feet consist chiefly of magnetite specular iron and pyrites, and the indications warrant further prospecting being done.

Some distance further north the outcrop is overlain by basalt. The general strike of the formation is apparently a little east of north. All along the line the local attraction is so great that the magnetic compass is not of much use, and in connection with this I would strongly urge that in every mining district the true meridian be ascertained and laid down with permanent marks. At present all the mining surveys start with a magnetic bearing, and this often leads to considerable errors.

Specimen Reef, Hall's Creek.—A good deal of work was done here some years ago, including the bringing in of a water race about four miles long, and the erection of a six-head battery driven by a water-wheel. Three tunnels have been put in, and altogether over 2000 feet of driving has been done. No. 1 tunnel, bearing N. 30 E., was driven along the reef for about 300 feet and connected with the surface by several rises. At about 80 feet from the entrance a winze was sunk on the reef which underlays rather flat to the S.E., to connect with the No. 2 level 100 feet below, and at 60 feet down an opening was made in either end and short drives put in north and south. The north end shows about a foot of dark carbonate of iron, which is said to be the matrix in which the best gold occurs here. The drive south shows only traces of the lode, with blue pug on the footwall. Above the tunnel for some distance beyond the winze the ground has been stoped to the surface, which is here only 25 to 30 feet above, and some rich patches of gold were obtained. No. 2 tunnel has a total length of about 1000 feet, including 300 feet from the entrance to the lode. Just beyond where the lode was struck the ground had come away from the back and blocked the drive.

In No. 3 tunnel, which is about 100 feet below No. 2, the lode was cut at about 500 feet, and has been followed 200 feet to the north. When I saw it the lode was about 3 feet wide, rather broken with bunches of quartz and a little carbonate of iron. The intention is to drive under what is known as White's winze from No. 2 level, some 400 feet ahead of the present face, where a very rich shoot of stone is said to have gone down under foot, but could not be followed on account of water. Another good shoot may be cut at any time, and the present proprietors certainly deserve success for their pluck in doing so much dead work in face of great difficulties. Another formation carrying quartz and carbonate of iron was cut in the main tunnel about 60 feet beyond the present drive, but no work has been done on it. The gold found in this mine is said to be generally covered with oxides of iron and manganese occurring in black lumps locally termed "clinkers." Simple battery treatment would probably result in a big loss, and grinding and pan-amalgamation would be necessary. In places there is a good deal of pyrites which is also said to assay well for gold, and to save this considerable additions and repairs will have to be made to the battery, but very little can be done in this way until better means of access are provided.

HEAZLEWOOD AND WHYTE RIVER DISTRICTS.

The greater portion of the rocks of these fields consists of igneous rocks of very varying composition and structure, ranging from acidic through basic to ultra-basic. In the western portion of the field they are generally coarsely crystalline, but to the east are fine-grained to compact, and throughout the field have been more or less chemically altered to serpentine.

Messrs. Twelvetrees and Petterd have recently made an extended microscopical examination of some of the rocks from this neighbourhood, and have identified the following varieties:—Hornblende-granitite, Porphyritic diabase, Augite syenite, Gabbro of several types, and several varieties of the Pyoxenite and Peridotite families. These rocks are probably of several different ages, but prolonged examination in the field and careful microscopical and chemical examination would be necessary to determine their relations to one another and the sedimentary rocks, through which they have intruded in numerous dykes and bosses. The sedimentary strata, consisting of limestones, sandstones, and slates of silurian age, are best seen to the west of the Godkin line of lode, narrowing going north and cutting out altogether on the other side of the Heazlewood River, but widening to the south. Narrow belts are also seen further east separated by igneous dykes, the slates near the contact being frequently porcellanised and altered to hornstone.

The main line of contact on the west crosses the Waratah-Corinna track, near the 18-mile peg from Waratah, and the slate country to the west of this should be well prospected, being very favourable for the occurrence of lodes.

The only work that was going on in the Heazlewood District at the time of my visit was on Section 1758–91M, 80 acres, owned by the Lord Brassey Nickel Company, situated on a high hill to the north of the Heazlewood Bridge. Several small veins containing nickel ores have been found on this and the adjoining section to the south.

A shaft, now full of water, was sunk at the top of the hill on an E. and W. vein, and some good ore was obtained. The nickel is chiefly in the form of sulphide of nickel and iron, and I have been unable to detect any trace of arsenic in it with the blowpipe. It is of a light bronze colour, and in powdered form is attracted by the magnet, resembling pyrrhotite, but clean samples are said to have assayed as high as 40 % nickel. Mr. Petterd informs me that he has submitted samples to the well known mineralogist, Professor Dana, of the United States, who has pronounced it to be a new mineral, and the name "Heazlewoodite" has been proposed for it. So far as could be seen, it is always associated with the green hydrous carbonate of nickel zaratite.

The serpentine in which the veins occur is traversed in all directions by slickensided planes, probably due to differential movements within the mass. These are sometimes coated with a thin film of zaratite, and have led to a lot of useless work being done. A tunnel started presumably to

cut the vein on which the shaft was sunk has a very tortuous course of 265 ft., having followed these "greasy heads," and has gone right away from the supposed course of ore. A deviation has, however, been made, and the tunnel is being taken in straight, but had not reached the vein when I was there.

On the adjoining section to the south, 102-93M, 52 acres, known as Roy's Luck, a shaft was sunk 20 feet on a vein running about N.W., and there is said to be 6 to 9 inches of solid sulphide ore in the bottom, but as the shaft was full of water I could not examine it. A tunnel has been driven in an easterly direction along the northern boundary of the section to intersect this vein, and is in 120 feet, but has not yet reached it. This work is temporarily suspended, but should be pushed ahead in view of the prospects obtained at the bottom of the shaft. The veins cut on the surface vary in strike from W. to N.W., and it is probable that at the points of intersection good bunches of ore may be met.

Several other sections have been taken up in this vicinity, but no work has been done on them.

The weathering of the Serpentine forms very little soil, and the hill is bare of trees, so that timber for mining purposes is difficult to obtain.

On an uncharted section about a mile and a half S.W. from the Heazlewood Bridge several trenches have been cut across a quartz formation, carrying in places a little copper pyrites. In one of these trenches there is about six feet of broken quartz, but I could see no ore in it, though some of the stones at the side of the trench show a little copper pyrites. Further to the south a shaft, now full of water, was sunk about 20 feet, and I was informed that three tons of ore, assaying 23 per cent. copper, had been sent away; but I could get no information as to the size of the lode at the bottom, or the silver and gold contents of the ore sent away, and can therefore form no opinion of its value.

Heazlewood Mine.—This property consists of two 80-acre sections, 1309-87M and 1310-87M. I was only able to make a hurried examination of the workings, which have been abandoned for some time. On section 1309 a main shaft was sunk 160 feet, and equipped with a small winding-plant. An adit level, about 390 feet long, driven along the lode from the eastern side of the hill, connects with the shaft 60 feet below the surface. The lode here stands almost vertical, striking about N.N.W. Above this level it has been stoped to the surface, and was I believe in places up to 14 feet wide, mostly filled with fragments of the enclosing serpentine country rock, calcite, with small veins and bunches of galena and zinc blende; and I am informed that 230 tons of ore, averaging 56 per cent. lead and 88 oz. silver per ton, were sent away from here. In one place, near the shaft, I noticed a nice vein of galena about six inches wide going down underfoot; but below this level the shaft is full of water, and I could not learn what the lode was like at the bottom.

On the western side of the hill a tunnel has been driven about 400 feet towards the main shaft, and at 220 feet connected with the surface by an air shaft 70 feet deep. Two short cross-cuts were also driven from the main tunnel, but I could see no sign of any lode formation.

On the southern block, Section 1310-87M, several parallel lodes have been cut and three tunnels were driven, aggregating, including cross-cuts, about 1400 feet. The lowest tunnel is about 330 feet below the brace of the main shaft, and is said to be 475 feet long with a cross-cut of 136 feet, but the entrance was blocked. 50 feet above this, higher up the creek, is another tunnel 375 feet long connected with the surface by a cross tunnel. The bulk of the lode-filling appears to have been shattered country rock containing small veins of galena associated with blende, pyrites, quartz, and calcite.

Further up the creek is a third tunnel, 387 feet long, from which better prospects are said to have been obtained, but this I unfortunately missed.

From the main shaft a fair cart road about three quarters of a mile long connects with the Waratah road between the 14 and 15 mile pegs, so that the property is easily accessible, and the amount of ore already won should encourage another trial being given to the mine.

The Heazlewood Main Lode has been traced through Sections 825-87M and 4-87M, formerly known as the Heazlewood Extended, and a good deal of prospecting by means of tunnels and shafts was done some years ago. I had no time to examine these, but I understand that several small veins of galena were cut and some ten tons of ore sent away, but nothing was discovered which could be considered payable.

From the Heazlewood shaft a good pack-track about 3½ miles long has been made to the Mt. Stewart Prospecting Association's property, consisting of two 80-acre blocks, Section 763-93M and an adjoining block to the north not numbered.

Crossing the Whyte and Castray Rivers sandstones and limestones are seen, but further south serpentine rocks again occur, and the boundary between the igneous and sedimentary rocks has not been determined. The track passes by the old Castray River Company's workings, where a little alluvial gold is still being obtained.

The Mt. Stewart workings are situated on a rather flat hill at an elevation of about 1400 feet above sea-level. A lode running approximately north and south has been traced through the property, and two shafts were sunk on it, but both of these were full of water. The top shaft is 43 feet deep,—the lode at the top being about 2 feet 6 inches wide of galena blende and quartz, showing a crustiform structure. In the bottom there is said to be about 10 inches of clean high-grade galena in three veins. The lower shaft is 19 feet deep,—the lode being about 2 feet wide, mostly quartz and blende, with a little galena. Two tunnels have also been driven to cut the lode, but on account of the flat nature of the country it has not been possible to get any great amount of "backs." In No. 1 tunnel, known as Harvey's tunnel, the lode was cut at 120 feet, and some high-grade galena is said to have been obtained, but I was unable to see the lode, as the end was blocked. This tunnel is too shallow to be of much use, and another tunnel has been driven by the present proprietors, which, at the top shaft, should give about 70 feet of "backs." The lode was struck at 100 feet, and a drive put in along its course 520 feet in a northerly direction. The lode has varied from a trace up to the full width of the drive, carrying in places small seams of zinc blende and siliceous galena, said to assay up to nearly 200 ozs. silver per ton. At 560 feet from the entrance a rise has been put up 40 feet, and this should be continued to the surface, a further distance of 15 to 20 feet, as the air in the end is rather light, and only one shift has been able to work. The present face is about 400 feet from the top shaft, but the last 60 feet have apparently been off the course of the lode. At 580 feet a small prospecting cross-cut has been driven 33 feet to the east without cutting it, and it seems probable that the lode lies to the west of the drive. Where seen the lode shows a favourable banded structure characteristic of true fissure lodes; and the ore is of a high grade,—a bulk sample from several tons raised having, I am informed, shown it to be worth about £15 per ton.

To the west of the main lode is a vein of talc 12 to 18 inches wide running about E.N.E., and showing in places stains of carbonate of copper. Though of not much importance in itself, it should be traced to where it intersects the main lode.

Another interesting occurrence on this property is what is called the "opal lode," a vein filled with chalcedony and common opal of various shades. Messrs. Twelvetrees and Petterd have made a microscopical examination of this stone and pronounced it to be "opalised serpentine."

Whyte River Mine, Section 109-93M, formerly 1083-87M, 34 acres.—On this section two tunnels have been driven on the north side of a hill running through the section, and one on the south side. No. 1 tunnel, which is only about 30 feet below the crown of the hill, was driven about 200 feet through soft decomposed igneous rock, and at 100 feet a lode formation about 5 feet wide was cut, consisting chiefly of shattered country rock stained with oxides of iron and manganese, impregnated with chromate and carbonate of lead. A winze on this connects with No. 2 level 60 feet below No. 1. In No. 2 tunnel the lode was cut at 160 feet from the entrance, and a drive put in about 200 feet in a general south-easterly direction. The lode is here very similar to No. 1 level, having no defined walls, and showing in places crystals of chromate of lead. A little beyond the rise to No. 1 level a winze was sunk 30 feet and a little stoping was done, but these workings were full of water. Good ore is said to be going down under foot, and on the tip at the mouth of the tunnel is some nice-looking galena mixed with a good deal of blende. No. 3 tunnel, on the south side of the hill, is about 110 feet below No. 2. It was driven almost due north for about 500 feet, where the lode was cut and driven on 170 feet, its course being north-westerly. The lode is here better defined than in the upper levels; but here, too, is chiefly filled with broken country rock with occasional bunches of pyrites and galena, quartz, and a good deal of calcite. Native silver is also said to have been found in this level, but I did not see any. This lode is supposed to be a continuation of that worked in the Bell's Reward mine, but is more probably a parallel one.

Bell's Reward.—The property formerly known as the Bell's Reward Mine comprises Sections 245-93M (40 acres) and 44-87M (20 acres) lying to the south of the Whyte River Mine. The workings are situated on the 20 acre block, and consist of several tunnels and a main shaft 156 feet deep. The main adit, which is about 500 feet long, was unfortunately blocked at the entrance, and as the shaft was full of water it was quite impossible to form any idea of the value of this property. On the surface there is a strong gossan outcrop which can be traced through the Discoverer, Godkin Extended, and Godkin Sections, the general strike being about N.W. and S.E. On the western side of the lode limestone, sandstone, quartzite, and slates occur, the country to the east being chiefly decomposed igneous rock, though occasional patches of sedimentary origin are also seen. Mr. Montgomery, late Government Geologist, after a careful examination of the Godkin Mine in December 1892, came to the conclusion that the lode is a contact one, and the sedimentary rocks seen to the east of the lode are either isolated patches or tongues projecting into the main igneous mass, and this seems most probable. The sedimentary strata have been a good deal broken

by the intrusive rocks, thus allowing passages for the circulation of mineral-bearing solutions, and the sandstones and limestones are often traversed by small threads of blende and galena. A lode is also said to have been cut in the limestone in the main adit and was followed for about 100 feet, but I have no information as to its size or quality. In a open cut close to the engine-house I noticed little chloride of silver in broken sandstone impregnated with oxides of iron and manganese, and all the gossan is said to carry a little silver. The main shaft is a roomy one, being 13 ft. × 4 ft. in the clear, and well timbered as far as could be seen. From the bottom I believe cross-cuts were put in S.W. 120 feet and N.E. 40 feet, when a burst of water drove the men out, and no work has since been done. It is probable that the lode was struck, and it seems a great pity that after spending so much money no effort was made to get the water out and see what the lode was like.

A good cart-road was made from the mine to the Waratah road, near the 13-mile peg, and I believe 7 tons of ore, assaying 65 ozs. silver per ton, were sent away.

On Section 916–87M, known as the "Discoverer," or Smith's section, two tunnels over 200 ft. long were driven, and one short one. No. 2 passed through clayey decomposed igneous rock for about 100 ft., when a belt of sandstone was cut, and beyond this there is a very strong manganese gossan formation, the western wall of which was not reached. No. 1 tunnel, 110 ft. above No. 2, was partially blocked, but as far as could be seen was similar to No. 2. The gossan is said to carry a little silver, but not in payable quantities, and sinking will have to be resorted to to prove the value of the lode. From what is seen in the Godkin mine, it is evident that the zone of oxidation extends to a considerable depth, but should good "pay-ore" be met with in that mine, this section should be well worth developing.

Godkin Extended, Section 62–93M, 80 acres. A good deal of work has been done on this section, with disappointing results. On the east side of the hill a tunnel was driven 105 ft. in a S.W. direction; the first 60 ft. through clayey decomposed country much stained with oxides of iron and manganese, and the remaining 45 ft. through sandstone. A shaft was also sunk 80 ft. through broken country containing bunches of gossan assaying a few ounces of silver per ton. On the west side of the hill a tunnel was driven 150 ft. through soft sandstone, and connected by a winze with the main adit 120 ft. below, which is 827 ft. long. The first part of this tunnel is in soft decomposed slate, which is succeeded by sandstone and quartzite, the latter gradually merging into limestone, which continues for the last 200 feet.

At 400 feet from the entrance a gravelly bed was cut, the pebbles of quartz being in places cemented together with blende and galena. A drive was put in to the north-west and a little stoping was done over the back of the drive, some 40 tons of ore having been sent away from here, averaging about 120 ozs. silver per ton with a low percentage of lead, and some of the clean galena is said to have bulked 350 ozs. silver per ton. Ore was found for a length of about 40 feet, but soon cut out over the back of the drive, and it appears to have been only a pocket. The end of the drive was blocked, but Mr. Thorne, the late mine manager, informed me that it was continued to 151 feet from the flat sheet through loosely cemented gravel and sand, and that at 100 feet he had put in cross-cuts and struck limestone on both sides, the width being about 25 feet; but it is very difficult to explain the occurrence of the limestone here. A winze was sunk about 10 feet south-east of the main adit to a depth of 23 feet and from the bottom sandstone was obtained, carrying strings and splashes of galena and blende, but there does not seem to be any real lode.

At 490 feet broken sandstone was met with, and a short drive put into the north-west. Above this drive is a cave of considerable extent, and in the joints in the sandstone is a brown slime which is said to carry a little silver. A little beyond this the course of the drive, which up to this point has been approximately north, has been turned to the east, and the end is within 20 or 30 feet of the eastern boundary of the section, the last 200 feet being in limestone.

Godkin Mine, Sections 1599-87M, 1615-87M, 40 acres each.—For a detailed description of the workings of this mine I must refer to Mr. Montgomery's Report of December, 1892, already mentioned, which was published with the Annual Report of the Secretary for Mines for 1892-3. All the workings on the southern section were full of water below the 45 feet level, and the only work that is being done is at the north shaft. A small pumping plant has been erected here, and the shaft sunk to 80 feet below the level of No. 5 tunnel. The bottom of the shaft is in gossan, and a cross-cut has been driven 30 feet through this to the south west, and from the end a drive put in 30 feet to the south east. The gossan, which contains a great deal of black oxide of manganese, is full of vughs, making it very bad for shooting, and progress is consequently slow. Mr. Scaddon, the mine manager, informed me that the gossan contained a little silver, but not in payable quantities. From the fact that galena was obtained from two winzes sunk between 30 and 40 feet below No. 5 tunnel, it was hoped that the oxidised zone would have been passed through, so the result is very disappointing. The first of these winzes is about 100 feet south east from the shaft, and from the open character of the lode-matter it is probable that this winze will soon be drained, and galena may be met with in the drive, but it is evident that the shaft will have to be sunk deeper to reach the main unoxidised portions of the lode.

Pike's.—On Section 2508-87M, known as Pike's Section, situated about a mile and a half south-
t of the Godkin mine, a tunnel was driven, and at 100 feet from the entrance a lode was cut,
ning about north east. This has been followed for about 100 feet, and occasional patches of
san with carbonate of lead and antimonial galena were met with, but the bulk of the lode-filling
pears to have been broken country rock. The galena is said to be of low grade, and I do not con-
er that this find is of much importance, except as showing the extent of the mineral-bearing country.

On Section 1220-93M, 80 acres, formerly known as the Washington Hay, is a strong outcrop
manganese gossan striking a little east of north. A small shaft was sunk on the lode (which is
nost vertical) to a depth of about 80 feet, showing in the bottom about two feet of carbonate of iron
th a little galena and blende. The shaft being closely timbered, the lode could not be seen higher
, but the ore at the surface shows some nice-looking coarse and fine grained galena with carbonate
iron and quartz, and gossan with crystals of chromate and carbonate of lead. Fifty feet below
e surface a short cross-cut was put in to the west and a small vein of gossan carrying blende was
ven on a few feet; a little chloride of silver is also said to have been obtained from here. The
intry is a good deal broken and stained green, probably with oxide of chromium. Another
ening higher up in the north end of the shaft shows several feet of promising looking gossan
th chromate of lead disseminated through it. About 110 feet below the shaft an adit has been
ven 250 feet a little west of south along the course of the lode towards the shaft, the end of the
ve being about 50 feet away from the shaft. The lode is a strong one, widening in one place to
out 8 feet. The bulk of the lode-matter is carbonate of iron containing small veins of galena
:h blende and pyrites, and I believe 30 tons of high-grade galena were sent away. The
ospects of this mine warrant another trial being given to it. The Godkin Tramway passes just
ove the tunnel, so that the property is easily accessible.

Confidence Mine.—To the south-east of the Washington Hay, on Section 671-93M., 40 acres,
merly the Washington Extended, and now known as the Confidence, a good deal of work has
en done and several small parcels of galena, about 50 tons in all, which, I am informed, assayed
out 65 per cent. lead and 140 ozs. silver per ton, were sent away. No. 2 tunnel, 40 feet above
e Whyte River, was driven about north-east, and the lode cut at 160 feet. This has been followed
0 feet, bearing a little east of north, being from 6 inches to 2 feet wide, carbonate of iron and
gments of country rock with occasional bunches of galena and blende.

No. 1 tunnel, 100 feet above No. 2, was driven nearly due east, and the lode cut at about 200
t. Before cutting the lode a belt of broken country about 50 feet wide was passed through, much
ined with oxide of iron, and in places approaching a true gossan. A sample across this is said to
ve given 56 ozs. silver per ton. The lode has been followed a little east of north for 120 feet,
d at 30 feet from the flat sheet an air shaft connects with the surface about 60 feet above. At 80
t the lode is apparently split and the western branch is being followed. Several good shoots of
lena have been cut, and in the face, when I saw it, there was a vein of about two inches clean galena
th about two feet of gossan, containing carbonate and phosphate of lead; a sample of this gossan is
d to have given 65 ozs. silver per ton.

An intermediate tunnel about 40 feet below No. 1 was also started and driven 100 feet, but
d about 40 feet further to go to reach the line of lode when work was stopped.

This mine has been recently re-started by a small syndicate, and the prospects of success seem
ry fair. Work is at present confined to driving No. 1 level with one shift. No. 2 tunnel would
ve to be extended between 300 and 400 feet to reach the shoots of ore cut in No. 1, but this
uld be a valuable prospecting work, and would prove the lode to a depth of about 170 feet.
seems probable that this lode is a continuation of the Washington Hay lode. The Godkin
mway passes through this section between the intermediate and No. 2 tunnels.

Washington Mine.—West of the Washington Hay and north of the Confidence is an 80-acre
ck section 1150-93M, known as the Washington. Two tunnels have been driven on this
operty. No 1 is 120 feet long through clay and decomposed slate, with bands of hornstone. At
feet from the entrance a drive was put in 33 feet to the north, but I could see no sign of any
le formation. No. 2 tunnel, 130 feet below No. 1, was driven 300 feet, bearing N. 70° W. The
st 120 feet are through weathered igneous rock passing into a dull greyish green rock, containing
great deal of carbonate of lime. It seems probable that the intrusive rock, has here absorbed
me of the sedimentary strata through which it has broken. At 73 feet from the entrance a drive
as put in 100 feet to the north-east and 580 feet in a general south-west direction, the last 100 feet
eing nearly south. A little galena is said to have been obtained from a winze sunk 11 feet below
his level (now full of water), and some stoping was done above the drive on a vein of oxidised
natter, which is said to have yielded a little high grade ore, but I could see nothing of any value in
ne drive.

Gregory, Section 3590-87M.—The workings on this section are situated close to the road about
ree-quarters of a mile above the *Whyte River Hotel.* Crossing a creek a little above the road a

trench has been cut along a small lode formation striking about north-east and south-west. In one end it is about 15 inches wide, and in the other end two feet, mostly quartz with splashes of galena and pyrites. A tunnel driven in a south-east direction from the level of the road cut the lode at 241 feet, and a little driving has been done on its course to the north-east. This drive was blocked, but it is, I believe, connected to the surface by a shaft 65 feet deep. Where cut the lode is about one foot wide, similar to what is seen on the surface, and some good assays are said to have been obtained. This lode is apparently a contact one, altered slates being seen to the east of the lode, and serpentinous igneous rock to the west. As far as can be seen it is too small to be of much value.

Although a considerable amount of money has been spent in the Heazlewood and Whyte River Districts, they cannot be said to have had a fair trial. The galena is mostly of a high grade, and the prospects at several of the mines warrant the expenditure of further capital in legitimate mining. The high freights charged on the Waratah-Burnie railway, £2 per ton, have retarded the progress of the fields, but I have been informed that a substantial reduction would be made for parcels of 40 or 50 tons. Limestone and ironstone could be easily and cheaply obtained for fluxing purposes, but until much more development work has been done it would be quite premature to consider the question of erecting furnaces.

Magnet Mine.—From the Whyte River Bridge the road rises about 1000 feet in 3 miles to the top of the Magnet Hill, whence a pack track about three miles long leads to the Magnet mine. This property consists of one 20 acre block, 3705–87M, and two blocks of 40 acres each, 2074–91M and 2075–91M, lying to the north and south respectively of the smaller block on which the workings are situated. The lode has been traced by trenches through the section, and shows a strong body of very promising looking gossan with veins of galena, showing banded structure on either wall. Its strike is apparently about north-east and south-west, and at the surface it is nearly vertical, but in the upper tunnel underlays considerably to the north-west. To the east of the lode the ground falls rapidly towards a large creek running into the Arthur River, the outcrop being about 250 feet above it. No. 1 tunnel, which is only between 30 and 40 feet below the outcrop, was driven nearly due west. At 12 feet from the entrance a vein of galena was cut, and beyond this 13 or 14 feet of gossan were passed through with another vein of galena on the west wall. The cross-cut was continued to 114 feet through decomposed igneous rock, probably porphorite. North of the cross-cut the lode has been driven on 88 feet, and on the south side a drive of 50 feet was put in along the footwall, and a drive of 135 feet along the hanging wall of the lode. From the north end a rise was put up to the surface, and a little stoping has been done on either side of this as well as over the back of the south drive, and between 70 and 80 tons of high grade galena and oxidised ore have been sent away. Mr. Meredith, legal manager of the company, has kindly showed me the returns received from about 50 tons sent away between August, 1896, and April, 1897. The average net price received was between £19 and £20 per ton, the highest being £23 3*s.* 6*d.*, and the lowest £13 12*s.* 11*d.*, the latter for a parcel of oxidised ore low in lead.

There are several small veins of clean galena, but the bulk of the lode-matter at No. 1 level consists of gossan containing crystals of cerussite (carbonate of lead), crocoisite (chromate of lead), and leadhillite (sulphato-carbonate of lead.) In the north end the lode is somewhat broken, and contains a good deal of dolomite, and throughout the load bunches of carbonate of lime and iron occur, surrounded by a crust of galena, forming so-called "ring ores."

No. 2 tunnel, about 40 ft. below No. 1, and a little to the north of it, was driven about 225ft. bearing N. 55° W. In this tunnel a hard bar of dolomite was encountered, showing in places threads of galena, and a little native silver is also said to have been found. Near the end a cross drive has been put in 28 ft. S.S.W. In the face of this a little galena was showing through the dolomite, and at the time of my visit preparations were being made to continue this drive. Since my return I have heard that good galena has been cut, considerably enhancing the value of the property.

The oxidised ores from No. 1 level contain between 20 and 25 per cent. of moisture, and on account of the high freights it is found advisable to dry this before mixing with the sulphide ore. Only what is considered the best of it is sent away, and there is a large pile of stuff which is not considered good enough to ship at present, but which should pay well to smelt on the spot.

The trenches to the south of the tunnels show the lode to have the same favourable appearance. The ground here falls much more rapidly to the east, and it would be very advantageous to put in a low level cross-cut.

From the mine to the top of the hill the track is very steep, after which it has a good grade but is in many places in a terrible state, and the cost of getting the ore to Waratah is naturally heavy, viz. 27*s.* 6*d.* per ton. In a direct line the distance is only about four miles, but the intervening country is very broken and rugged. I am informed, however, that a good grade for a tramway could be obtained in 8 or 9 miles, and this will probably be eventually constructed, but in the meantime cording of track to the main road is urgently required.

This mine has undoubtedly very good prospects, and deserves more vigorous development.

From here to Waratah the old Waratah-Corinna track was followed, crossing the Arthur River, and passing through the old West Bischoff Company's property. On Section 1416-93M, formerly 2481-87M, a little work has been done on a small lode carrying sulpantimonite of lead (probably zinkenite or jamesonite), zinc blende, and a little pyrites. One sample is said to have given 52 per cent. antimony, so it is probable that stibnite also occurs. Two short tunnels have been driven along the lode through black slate. In the top tunnel there is about six inches of ore in the face, and in the lower one about ten inches. The ore is said to carry traces of gold and a little silver, but not in payable quantities, and the lode is too small to encourage much work being done on it.

On Section 1445-93M, formerly 922-91M, known as Kegan and Daly's, a tunnel bearing E.S.E. was driven 363 feet. At about 180 feet from the entrance a dyke of quartz porphyry was cut, which proved to be about 30 feet wide. This is said to carry a little tin throughout, but not in payable quantities. The country on either side of the dyke consists of altered slates and grits, in places a good deal iron-stained, and I noticed one small vein of carbonate of lime and carbonate of iron, but nothing of any value.

On the surface several trenches have been cut across an iron-stained outcrop, samples from which are said to have given from 4 to 34 ozs. silver per ton. This looks like the decomposed capping of another igneous dyke. It could be best prospected by continuing the tunnel, but I am not very sanguine as to its proving of any value.

The only other property visited in the vicinity of Mount Bischoff was the old Silver Cliff mine, Section 1209-93M, 40 acres, formerly 28-91M. After the original company ceased active operations, the mine was let on tribute, and I believe some 50 tons of high grade galena were obtained from what is known as No. 2 lode. A tunnel 90 ft. long on the course of this, about N.N.W., shows the lode to be 3 ft. to 4 ft. wide at the entrance, but it has cut out in the end. It has, however, been traced further up the hill, and some high assays are said to have been obtained from the outcrop. 42 ft. from the mouth a winze (now full of water) was sunk to a depth of 50 ft. below the level of the tunnel, and there is said to be very good ore in the bottom of this, but water became too strong, work was abandoned by the tributors, and the section was forfeited. It was then taken up by a small party of men, who are doing their best to prove the value of the lode. A short distance south of the tunnel a small shaft (now full of water) was sunk on the lode, and a little driving done at a depth of about 40 ft. by the old company, who also started a crosscut for the lode about 130 ft. below the shaft. The present owners continued this crosscut from 86 ft. to 220 ft. At 196 ft. a small vein carrying pyrites was cut, and this has been followed a little west of north for 127 ft., widening in places to 2 ft., with occasional bunches of cubical galena associated with jamesonite, zinc blende, and pyrites, with carbonate of iron and quartz, but so far nothing payable has been met with. The present intention is to drive under the winze from the tunnel (a further distance of about 130 ft.), and rise against this to work the shoot of ore in the winze, with the hope of cutting other shoots on the way. The lode has well-defined walls, and the enclosing slates are of a kindly nature, but so far the results have not been very encouraging.

From the foregoing brief account it will be seen that the extensive area of country covered by this Report is exceptionally rich in minerals, and every inducement should be given for further prospecting by constructing new tracks and improving old ones, as there is great probability of other valuable discoveries being made.

The distance from Waratah to Corinna by the present route is 40 miles. From Waratah a good road has been made as far as the Heazlewood Bridge at the 16-mile Camp, and this is now being continued round the Bald Hill, where the old track is particularly bad. At the Corinna end there is a good cart road for five or six miles, and between these points is a fair bridle track which, at no very great expense, could be made wide enough for cart traffic. The tracks branching off from this are mostly in a very bad state, and when it is considered that everything has to be packed over such tracks, I think that too much credit cannot be given to the hardy prospectors.

In conclusion, I wish gratefully to acknowledge the kindness and hospitality with which I was everywhere received, and have also to thank Mr. Hall, M.H.A., and others for the great assistance rendered me.

I have, &c.

J. HARCOURT SMITH, *B.A.*,
Government Geologist.

The Secretary for Mines, Hobart.

REPORT ON THE SHEPHERD AND MURPHY'S TIN MINE, BELL MOUNT.

Mines Office, Launceston, July 26th, 1897.

SIR,

ON the 5th of June, in accordance with instructions, I visited the Shepherd and Murphy's Tin Mine, Bell Mount, and have the honour to present the following brief Report thereon :—

This property is situated 22 miles south-west from Sheffield, at an elevation of about 2000 feet above sea level. The River Forth is crossed at an elevation of 250 feet, 9 miles west from Sheffield, the rise on either side being very steep. The road passes most of the way through rich agricultural land of a chocolate colour, characteristic of the weathering of basalt. Going down into the Forth valley a small belt of sandstone and conglomerate is crossed, but basalt is again seen on the other side of the river, and the land has been taken up for agricultural purposes for some six miles further. About 2½ miles from the bridge the road junctions with the road running down the Forth valley to Leith, and thence continues in a southerly direction along the divide between the Forth and Wilmot Rivers. The road has been cleared to the end of the agricultural holdings, (about 15 miles from Sheffield), but the last three miles are only partly formed. From this point, Hall's surveyed track to Middlesex was followed; the grade is on the whole good, but the track is even now almost impassable in places, and with much traffic would become quite so. The basalt country, covered with dense myrtle forest, continues as far as Bell Mount, where slates, sandstones, and conglomerates are seen, but the basalt again occurs about two miles further south, and continues, I believe, as far as Middlesex Plains.

The Shepherd and Murphy Tin Mining Company, No Liability, originally held Sections 1437–91M and 1456–91M, of 80 acres each, but Section 2134–91M, of 78 acres, known as Sykes' section, lying to the east of the other two, has been recently purchased. The greater part of the southern section (1456) and the western portion of 1437 is covered with basalt, but on the east sandstones, quartzites, and slates are seen. The principal workings are situated on the eastern half of block 1437, on a ridge sloping to the north between two small creeks which run through the section a little west of north, and junction with what is known as the Seven-mile Creek. Crossing this ridge in an east and west direction, a series of six small parallel quartz lodes have been discovered at distances of one to two chains apart, carrying oxide of tin, sulphide, and carbonate of bismuth, and wolfram; topazes, too, are occasionally found.

The most northerly lode yet discovered, known as No. 6 Lode, is exposed in a long trench, and shows about a foot wide of quartz containing crystals of oxide of tin. In one place it is split into two veins of about ten inches each, separated by a "horse" of sandstone, and on the southern wall is a soft clayey vein very rich in tin. I saw several dishes washed from the stuff broken from this lode, which all gave good prospects of coarse crystalline tin ore, but little or no bismuth or wolfram.

Very little work has been done on No. 5 lode; where exposed, it is from six to nine inches wide, and contains both tin and bismuth. On No. 4 lode, about a chain higher up the hill, a good deal of trenching has been done, and a tunnel driven 150 ft. along its course from the fall into the eastern creek. Where cut on the surface it was only about eight inches wide, but in the tunnel it was in places over two feet wide, the average width being about a foot. One very rich shoot of sulphide and carbonate of bismuth was cut, and the lode also contains a good deal of tin ore and wolfram. Several small parcels of hand-picked bismuth ore were obtained by former tributors from a deep trench along this lode, and the company is now sluicing the stuff thrown on one side, with very good results. This lode has, I believe, been traced through Sykes' section into Section 1–93M, further to the east, but I had no time to examine these sections.

On No. 3 lode there is a shallow trench, about 3 chains long, and what is probably the continuation of this lode, has been cut in the bottom of a deep trench running in a south-east direction on the west side of the hill. This cross trench also connects with a deep trench about six chains long on No. 2 lode, which gives good prospects for tin and bismuth, but is small. Small crystals of tin ore can also be obtained in places by crushing the soft friable enclosing sandstone. To the west the lode dips under the alluvial.

No. 1 lode, several chains south of No. 2, is about six inches wide, but very little work has been done on it.

Near the southern boundary of the section several shallow trenches have been cut through surface stuff, giving fair prospects of tin and a little gold, so it is probable that other lodes exist under the basalt further south. In the northern part of the section good prospects for tin, with a few colours of gold, can be obtained from the surface stuff, mainly of basaltic origin, which is here of considerable depth. To the west of the Western Creek a shaft was sunk to a depth of 20 feet through waterworn wash, which is said to contain tin and gold, but I did not see this.

In the cross trench above alluded to from No. 2 lode, the wash is in places about 10 feet deep, and gives good prospects for tin and bismuth. The bed-rock dips to the west, and everything points to the existence of deep ground under the basalt to the west of the creek, and to the east there is a considerable quantity of ground which should be worth sluicing if a good supply of water were available. The fall from the southern to the northern boundary of this section is nearly 400 feet, so that there are good natural facilities for sluicing, but the present water supply is quite inadequate for extensive operations. Mr. Mitchell, the mine manager, informed me that a good supply could be obtained from what is called the Weaning-paddock Creek, by cutting a race some five miles in length, and steps are being taken to have a survey made. A small but effective dressing shed has been erected in which the ore obtained by sluicing is further concentrated, and there are now about four tons of concentrates ready for shipment. These "concentrates" contain tin ore, wolfram, and carbonate and sulphide of bismuth, but I do not know in what relative proportions. It is impossible to make a complete separation of these minerals mechanically owing to their specific gravities being so close together, and the concentrates will be shipped to England for further treatment.

The directors of the company are hopeful of being paid for the wolfram as well as the tin and bismuth contents, but, as the separation involves costly treatment, the charges will be proportionately high. Hitherto the only ore shipped has been hand-picked bismuth ore, and Mr. Hinman has kindly shown me a copy of the account sales dated 18th March, 1897, of three small parcels totalling 19 cwts. The ore assayed from 57·1 to 60·1 per cent. bismuth, which was paid for at the rate of 3*s.* 11*d.* per lb., and the gross value of the 19 cwts. was £243 8*s.*, but the charges for sampling, assaying, commission, &c. amounted to £24 10*s.*, reducing the net value to £218 18*s.* The demand for bismuth is very limited, but even if the price should fall considerably a good margin of profit should remain. The lodes are small, but an effort should certainly be made to prove them at a greater depth, and this could best be done by driving adits in a southerly direction across their course. These lodes are probably connected with the granite which occurs further to the east in the old Dolcoath Company's ground. At present it costs £7 per ton for carriage of ordinary mining supplies from Sheffield to the mine, and for rations 1*d.* per lb., ore being taken as back freight for £3 10*s.* per ton, and a better track from the end of the made road is urgently required.

I have, &c.

J. HARCOURT SMITH, *B.A.*, *Government Geologist.*

The Secretary for Mines, Hobart.

(No. 51.)

1898.

PARLIAMENT OF TASMANIA.

REPORT OF THE SECRETARY FOR MINES FOR 1897-8:

INCLUDING REPORTS OF THE INSPECTORS OF MINES, &c.

Presented to both Houses of Parliament by His Excellency's Command.

Cost of printing—£36 12s.

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Geological Report on the Mineral Fields in the neigbourhood of Mount Black, Ringville, Mount Read, and Lake Dora ..... i–xxiv

CORRIGENDA.

On page xiv., line 9 from top, read "as well as to the W." instead of "N."

On page xxiii., line 17 from bottom, read 1 per cent. "Zinc" instead of "Tin."

REPORT OF THE SECRETARY FOR MINES.

Mines Department, Hobart, 26th July, 1898.

SIR,

I HAVE the honour to submit my first Report upon the Mines Department, and the progress and condition of the Mining Industry of the Colony, for the year ending 30th June, 1898.

Appended will be found Reports from the Commissioners of the condition of the Mining Industry in the Divisions under their charge; the Reports of the Inspectors of Mines; the Annual Report of the Government Geologist; the Annual Report of the Mount Cameron Water-race Board; a Report on the Tasmanian Smelting Company's Works; and the Government Geologist's Report on the Mineral Fields in the neighbourhood of Mount Black, Ringville, Mount Read, and Lake Dora, with Returns of the operations of the Diamond Drills, together with Returns showing the yield of gold, coal, tin, silver ore, blister copper, and copper ore; the number of persons engaged in mining; the number of leases and area of land held under lease for mining purposes; the net Revenue paid into the Treasury from Mines; the number of Mining Companies registered during the year; the total area of land applied for during the year; and the total amount of rents and fees received by the Department during the year.

General remarks.

During the year more legitimate mining has been carried on than in any previous year.

The amount of Revenue received by the Department is the largest since 1891, and the quantity of gold won is 79,981½ ozs., being a record for Tasmania; of this amount more than one-fifth has been produced by Mount Lyell. There is a slight falling off in the quantity of tin and silver ore exported, but this is more than counterbalanced by the increase in the quantity of coal, blister copper, and copper ore. The decrease in the quantity of silver ore exported may be accounted for by the severe loss sustained by several Companies through the disastrous bush fires, which raged through the West Coast during last summer, and destroyed buildings, machinery, and mining plant; also to the fact that many Companies are stacking their second-class ores until such time as the Tasmanian Smelting Company is prepared to treat them.

The total value of minerals and metals raised has exceeded £915,881, out of which dividends to the amount of £301,448 have been paid.

Mount Lyell.

The Mount Lyell Mining and Railway Company, Limited, have continued steadily at work, and during the year have exported 5062 tons of blister copper and 23,545 ozs. of gold.

Other mines in the vicinity are doing good prospecting work.

On the 15th February last the land known as the Mount Lyell Reserve, comprising an area of 2305 acres, was thrown open to applicants for leases under "The Mining Act, 1893." So keen was the competition for land in this locality, owing probably to its close proximity to the Mount Lyell Mine, and to several known discoveries of gold and copper within the reserve, that 450 applications were received by the department, embracing an area of over 25,300 acres.

After the pegging a meeting was held at Queenstown, and the applicants decided to amalgamate and form a large company to work the ground. This has since been done, and the applicants, with two or three exceptions, have transferred their applications to the Mount Lyell Reserve Copper and Gold Mine, No Liability, and the company, having succeeded in getting a Bill

through Parliament authorising the transfers and granting certain concessions, will be entitled to leases for the whole area.

This was undoubtedly the best course to pursue, as it will prevent litigation and having to decide by lot to whom leases would issue, while the fees returnable—over £7000—will be appropriated by the company as capital for working the mines.

Zeehan. This district is in a very flourishing condition, and is rapidly increasing its population. There has been a slight decrease in the quantity of ore exported during the year through the Comet Company's plant being destroyed by fire last summer, but new machinery has been erected: work will very shortly be resumed. Many new discoveries have recently been made which promise to substantially increase the output.

The Tasmanian Smelting Company have erected large and costly smelting works, which will prove of great benefit to the West Coast mines. A report and plan of the works is annexed.

Dundas. With one or two exceptions none of the mines in this district are producing ore. Active prospecting and development is going on at some of the mines, but many sections are still held upon which little or no work has been done.

Mount Bischoff. The output from the Mount Bischoff Mine for the year is 2256 tons. This company still continues to pay its dividends regularly, having up to the present time distributed among its shareholders £1,509,000 in dividends, equal to £125. 15*s.* per share.

With the exception of the Magnet, Rio Tinto, and Rocky River Mines, very little work is being done in this district.

North-West Coast. Very extensive iron deposits are known to exist in the vicinity of the River Blythe, but up to the present time very little work has been done. The claims are protected at present, but there is a prospect of a large amount of capital being introduced shortly to thoroughly develop the mines.

A little coal is being obtained from the Dulverton and Mersey Mines.

At Middlesex, Bell Mount, &c. four mines are in active operation, and 50 men are employed. Prospecting is being carried on in other parts of the field. About 50 sections are held under lease, but until there is good road communication it is very doubtful if mining operations can be successfully carried on.

Beaconsfield. The yield of gold from the Tasmania Mine is less than last year, owing to an inflow of water at the 718-feet level, which prevented operations being carried on at the lower levels for some months. The quantity of ore crushed was 29,998 tons; yield, 26,168 oz.; value, £98,590.

No dividends were paid during the last half year, but £14,553 was distributed during the first half of the year. The total amount paid in dividends is £667,161.

There is a probability of English capital being introduced to test the section to the south of the Tasmania Mine. The negotiations with English capitalists to deposit £40,000 to work the sections east of the Tasmania Mine have fallen through.

Lefroy. The New Pinafore and Volunteer Companies are engaged in sinking their shafts in search of reefs at the lower levels. The former is now down below 1150 feet, and the latter 1300 feet.

There are six other companies at work, and about 25 prospectors, but so far with very indifferent success.

The amount of gold won for the year is 1977 ozs.

North-Eastern District. Owing to the scarcity of water during the summer months many of the alluvial tin claims in the district were idle, but now that the wet weather has set in, and the market price of tin is improving, mining operations have been resumed.

At Mount Victoria considerable progress has been made during the year, and the future prospects are most encouraging. One company has opened out a reef at a low depth, and obtained 663 ozs. of gold from 363 tons of quartz.

Mathinna. Seventeen claims are being worked and prospected in this locality. The New Golden Gate Company are working at the 1300-feet level. The main shaft is down 1330 feet. The yield of gold for the year is 20,894 ozs., value £77,525. Total quantity of gold won to date, 114,871 ozs. Total amount paid in dividends, £194,400.

The reef has been struck in the two adjoining claims, and consequently a great impetus has been given to mining in the district.

Mangana. The Mangana (Tasmania) Gold Reefs, Limited.—This company has done a lot of work, having driven and sunk over 2579 feet, and have crushed 1537 tons of stone, yielding 384 ozs. of gold. They are employing at the present time 68 men, and have expended about £6000 in mining.

The shaft of the Salmon Gold Syndicate of Tasmania, Limited, is down 181 feet, with reef showing strong and payable. A large dam has been constructed ready for the battery.

Several other claims are being prospected with encouraging results.

Weldborough. Owing to the continued drought very little work has been done at these mines, and the population has decreased in consequence.

Lottah. The three principal mines are the Anchor, Australian, and Liberator. The Anchor Mine has been recently shut down pending the arrival of directors from England. A new manager has been appointed to take charge of the Australian Mine. A 30-head battery has been erected, which is driven by steam. Had they sufficient water-power to drive the plant this mine would pay well, as the stone is said to be fairly rich, giving 1½ per cent. of tin. The Liberator plant, which is almost purely automatical, was erected at a cost of over £12,000, and is most complete. The ore is not touched by hand from the time it leaves the face until it comes out ready for market. The trucks are run down from the face to the battery, a distance of about 400 yards, the full truck bringing the empty one back. 20 trucks per hour, each carrying about 16 cwts., are run down the incline to the battery. There are 20 heads working. The whole of the works are fitted up with electric light, and they are using an electric drill (the only one, I believe, in Australasia). It bores a 10-foot hole in 1½ hours which would take two men eight hours to do. The prospects of this mine are most encouraging.

Mount Nicholas Coal Fields. The Mount Nicholas and Cornwall Coal Mines are being worked with good results. As compared with last year there is an increase of over 3000 tons of coal raised. The Jubilee Mine is shut down at present, but the Company is prospecting an adjoining section.

Seymour Coal Fields. The Morning Star Company hold a large area of land at Seymour, and several good seams of coal have been discovered, but very little work has been done at present.

St. Helens. Very little alluvial tin has been obtained during the year owing to the scarcity of water during the summer, but as soon as some races (now in course of construction) are finished, I hope to see a revival in this district with good results.

The Wolfram Mine, near St. Helen's, is in the hands of a Melbourne syndicate for flotation.

Several discoveries of tin have recently been made giving, I believe, as much as 2 and 3 ozs. to the dish, and will be worked as soon as the water-races are completed.

The foregoing matters are here mentioned to show the progress of the Mining industry. Fuller details are given in the attached Reports of the Commissioners, &c.

Discoveries. A number of extended prospecting claims under Regulation No. 5 have been granted during the year, and active prospecting operations have been carried on, resulting in discoveries being made and reward claims being applied for as follows:—*Gold.*—D'Argular Range, about 10 miles from Birch's Inlet, vicinity of Corinna, on the Pieman Track; Dial Range; Edison Range, north of Gordon River; Whale's Head, Port Davey; Bridport; Red Hill, Parish Calder; and Flinders Island. *Silver.*—Dial Range. *Coal.*—Mt. Pelion, west. *Tin.*—Flinders Island. *Limestone.*—Vicinity of Queen River.

Mineral Specimens. The large and valuable collection of mineral specimens which were exhibited at the Tasmanian International Exhibition has been lent by the Department to the Tasmanian Museum.

Quarterly Reports. Quarterly Reports on the Mineral Industry of Tasmania, compiled by the Government Geologist, are regularly forwarded to the Agent-General in London for free distribution.

Mine Managers' Certificates. No candidates for examination for mine managers' certificates have presented themselves during the year, but five service certificates have been granted.

School of Mines, Zeehan. During the last 12 months the Zeehan School of Mines has been steadily developing along the lines which had proved so successful during the former year. Some 70 students attended the school during the year, the number on the books at one time being usually between 40 and

50. The feature of holding the classes in duplicate so as to allow of working miners attending at whichever class best suited their hours of work has been of great benefit. With the present accommodation and teaching staff the school can hardly accommodate more students: this is especially noticeable in the metallurgical section. The erection of a lead and copper smelting plant within a mile and a half of the school has given a great impetus to this branch of the work, and the chemical laboratory, which was originally fitted up for 6 students, has now to find room for 14, and others have had to be refused admission. Such additions as the building will admit of are now being carried out, and for its size the laboratory will be an efficient one. Instruction is being given in advanced analytical work to quite as high a standard as that given in any mining school in the colonies, and the examinations, which are held under the Mines Department, are a good guarantee that the work will be kept up to the standard. Recent appointments of assayers in Zeehan have shown that the public fully recognise that the school's certificates are the best mark of a man's fitness to deal with our local ores and their peculiarities. Classes are also being held in Mathematics, Mechanics, Mechanical Drawing, Geology, Mineralogy, Ore-dressing, &c., and are well attended. All improvements having to be made out of revenue is a serious handicap to the school's progress, as the fees for tuition have to be kept down to the lowest point.

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The yield of gold for the year has been 79,981½ ozs., as against 56,870 ozs. for the previous year, an increase in value of £97,264. Beaconsfield produced 28,418 ozs., and Mathinna 20,541, as against 35,934 ozs., and 16,117 ozs., respectively for the year ending 30th June, 1897; and Mount Lyell produced 23,545 ozs., valued at £98,889.

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The output of silver-ore was 15,120 tons, valued approximately at £177,160. The figures for the previous year were 21,123 tons, valued at £232,350, so that there has been a decrease of 6003 tons.

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There has been a decrease of 1278 tons in the output of tin ore for the year.

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There has been an increase of 1827 tons in the output of coal.

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4956 tons of blister copper, valued at £397,927, have been exported during the year.

vision of e Colony.

For departmental convenience the Colony is divided into Districts, as follows:—The Northern and Southern, comprising the country on the right and left banks of the River Tamar as far west as the River Forth, and on the east to the Scottsdale District, with such mineral country as there is in the southern portion of the colony, and includes the gold-fields of Beaconsfield, Lefroy, and Lisle. The North-Eastern District comprises the whole of the north-eastern country, including several important tin-fields, with the gold-fields of Waterhouse, Warrentinna, and Mount Victoria. The Eastern District comprises the eastern portion of the Colony, and includes the tin-fields of Weldborough, Blue Tier, Gould's Country, Ben Lomond, and St. Paul's River, the extensive coal-bearing country around Fingal and Seymour, with the gold-fields at Mathinna and Mangana. The Western and North-Western District embraces the wide area of country extending from the River Forth northwards, southwards, and westwards to the sea; it includes the celebrated tin deposits at Mount Bischoff, the River Iris, an extensive area of tin-bearing country at Heemskirk and Cox's Bight, the silver-fields at Heazlewood, Zeehan, and Dundas, the gold-fields at Mount Read, Mount Lyell, and the Linda, with other more or less important mining centres.

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During the year the Department and the mining community of the Colony have sustained a very severe loss through the retirement and subsequent death of Mr. Francis Belstead, late Secretary for Mines. Mr. Belstead was appointed Commissioner of Mines at Launceston in 1882, and succeeded Mr. Bernard Shaw as Secretary for Mines when that gentleman was appointed Commissioner of Police, and retained the position until the 31st December last, when, owing to ill-health, he was obliged to retire from the service upon a well-earned pension. Unfortunately his health still continued to decline, and he died on the 23rd April last. During his term of office Mr. Belstead proved himself a most capable and efficient officer, and gained the respect and esteem of all those with whom he came in contact.

Consequent upon my appointment as Secretary for Mines and the appointment of Mr. W. A. Pretyman as Chief Clerk in succession to me, the whole of the clerical branch of the Department have received a rise in position and salary. This has not only given general satisfaction to the officers themselves, but members in other branches of the service have expressed very great pleasure at the manner in which the re-organisation of the Department has been conducted.

The only other changes have been the appointment of another Clerk and Draftsman in the Department; Mr. F. N. Stops, Registrar of Mines, Queenstown; Mr. O. H. Root, Registrar of Mines, Scottsdale, *vice* Mr. E. W. Bonner, deceased; Mr. J. Fidler, Registrar of Mines, Waratah, *vice* Mr. G. Tegg, removed; and Mr. M. J. Griffin, Inspector of Mines, Gladstone.

It affords me very great pleasure to record my thanks to the various officers connected with the Department for the loyal, able, and willing manner in which they have performed the duties allotted to them since my appointment.

The Report of the Board is annexed.

Mount Cameron Water-race.

Details of the work done with these machines are appended.

Diamond Drills.

In conclusion, I have much pleasure in reporting that more legitimate mining work is being carried out than heretofore, and the future prospects are most encouraging.

I have the honour to be,
Sir,
Your most obedient Servant,

W. H. WALLACE, *Secretary for Mines.*

The Honourable the Minister of Mines.

REPORTS OF COMMISSIONERS.

Mr. Commissioner GLOVER reports :—

During the past twelve months no new development worthy of special mention has taken place on the Northern Goldfields.

The problem of the future of Lefroy as a goldfield still remains unsolved. The hopes of those interested in the success of this field, either by personal interests or general economic considerations, are at present centered in the operations of two mines on the New Pinafore and Volunteer reefs respectively. The proprietors of these have continued to sink in search of a renewal of the productiveness of the reefs at deeper levels; the former has now attained a depth of over 1150 feet, and the latter 1300 feet, and both companies express a determination to persist in deeper sinking as long as means to meet the expense of the operation can be obtained. This, however, can now only be accomplished by the contributions of shareholders, notwithstanding that, in the case of one of these mines, up to a few years ago some £70,000 had been distributed in dividends to the fortunate shareholders of that period before the productiveness of the lode ceased, at about 400 feet from the surface. In addition to these two creditably worked mines, there are, at Lefroy, six other regular mining operations; but, however promising the indications of some of these may be, being, as they are, dependent on the contributions of shareholders, unless some fortunate chance may disclose sufficiently rich "shoots" of gold at comparatively shallow levels, as has hitherto been the case with the temporarily successful mines at Lefroy, there is, I fear, little chance of any fortunate result. Unfortunately it has been the practice of mining companies to distribute in dividends from the commencement the profits which should reasonably be devoted to the work of effectually developing their mines, and the existence of the evil is likely to continue unless some means be adopted to check it. If a covenant were introduced in leases that, until a prescribed depth be attained, at least 40 or 50 per cent. of every dividend declared should be reserved and expended in the due development of the mine, it would cause many mines in the future to be worked to a successful result, instead of being closed at 400 or 500 feet, as has hitherto been almost invariably the case at Lefroy. There are some 25 prospectors at present engaged in the neighbourhood, some of whom are employed by Associations, but from the labours of whom no reliable result has yet accrued. There are in all about 145 men engaged on this goldfield.

At Beaconsfield the great impediment to progress is, the same as at Lefroy, the absence of sufficient capital. There is no local capital adequate to the effective development of a mine on the northern goldfields. It is a somewhat remarkable circumstance that, although the exceptional depth, extent, and continuous richness of the lodes of the Tasmania Mine are proved and established beyond the possibility of doubt, the enterprise of capitalists has never been enlisted for the purpose of locating the continuation of those lodes through the ground beyond that company's boundaries. It is true that several abortive attempts with inadequate funds have been made during the last 15 years, but no success has attended such efforts. During the past year the lessees of the sections on the east and the south of the Tasmania ground had all but completed negotiations with English capitalists, who had agreed to deposit £40,000 as a working capital, but for some unknown cause the negotiation was suddenly broken off. The owner of the southern sections is now in treaty with

other capitalists in London, and those of the eastern sections are now adopting the plan of following the principal reef from the Tasmania Company's ground into their own. The Ballarat Deep-Lead Company, which had expended some £8000 in the effort to prove the deep alluvial formation at the foot of the Cabbage-tree Hill range, having ceased active operations for several years owing to exhaustion of funds, their claims have been seized by "jumpers" as abandoned ground, and are now the subject of litigation. The old mining operations to the west of the township are still proceeding, but without any satisfactory result. A mine which was established a few years ago, known as the North Tasmania, as a gold mine, has developed into a silver and copper mine, the assays from the lodes of which are reported to afford highly favourable prospects, though at present this mine is only in process of development.

A sudden greatly increased inflow of water in the Tasmania Mine, which is well known to be one of the principal factors in the gold yield of the Colony some months ago, put an effectual stop to the mining operations in the lower and most productive levels of the mine for some months until the water could be discharged. So large a portion of the mine being precluded from work seriously diminished the yield of gold from Beaconsfield, the quantity of which for the past year amounted to 30,145 ounces, value £109,399. There are at present 632 miners employed on the Beaconsfield gold-field. The work of prospecting is actively proceeding in various directions about the locality.

The old alluvial gold-field of Lisle, being destitute of sufficient water for large sluicing operations, may be said to be worked out. During the past year, however. I have declared the whole gold-field available to diggers in extended claims of an acre each, and it continues to hold out inducement to some 40 diggers, and yields about 800 ounces of gold annually. The country comprising the Denison, Golconda, Panama, &c., occupies many prospectors, but want of capital prevents the development of several promising claims.

At Middlesex Plains, Bell Mount, &c., there are four mines in active operation employing 50 men, though as yet only in process of development. Nine or ten prospectors are employed on this field.

Should success attend the deep-sinking operations now in progress at Lefroy, of which analogy furnishes a strong presumption it will, it will certainly result in the application of the principle to the many now dormant mines at Lefroy, which, after the distribution of large dividends, were closed at a depth of some 400 feet, when they ceased to be productive; and at Beaconsfield the tracing of the Tasmania lodes into the adjoining claims will result in the establishment of other mines as rivals of that celebrated mine.

Mr. Commissioner O'Reilly reports :—

During the past year considerable progress has been made in the Mount Victoria locality in carrying on mining operations, and the prospects of this gold-field have very materially improved. One company having opened out a reef at a low depth, which is of good size, has commenced crushing from it, and won 663 ozs. of gold from 363 tons of quartz. Other claims are driving for reefs, prospecting and erecting machinery, &c., and a considerable amount of activity in this way prevails. It is considered that the propects of the place are very promising, and I look for very material and satisfactory progress being made during the coming year.

At Warrentinna there are four claims being worked, principally sinking on or driving for reefs, &c., but no gold has been won. The prospects of the field are represented as very good, but some of the claimholders do not appear to have sufficient capital to sink a sufficient depth to properly open out their mines.

In the Mussel Roe and Gladstone localities gold-mining operations are being carried on in a small way, but sufficient work has not yet been done to test the value of the reefs at a low depth.

The Waterhouse gold-field is practically abandoned, nothing having been done there for many years. This is much to be regretted, as the reefs have not been tested to a sufficient depth to warrant this neglect. This field is worthy of the attention of capitalists, and offers reasonable inducements for a moderate amount of capital being expended in prospecting at a good depth.

Some extent of alluvial gold deposit exists on freehold land situate near New River, in the Mount Victoria locality, and a portion of this area is now being mined profitably; 30 ozs. of gold has lately been won there by four men in a short space of time.

There are 112 men now employed at gold-mining in this district.

In consequence of the protracted drought and the low price of tin ruling during the past year, tin-mining operations have been carried on under very discouraging circumstances.

Owing to the short supply of water a good many of the claims were compelled to cease mining operations, and many miners had to leave the district and seek employment at the West Coast

mining fields. However, the recent rains have afforded a fair supply of water, and mining operations have been resumed with much vigour.

The recent advance in the price of tin ore will largely stimulate the carrying on more extensively of mining operations, and I look for a return to more prosperous times for the mining industry in this district during the coming year.

Mr. Commissioner DAWSON reports:—

The output of ore for the 12 months ending June, 1898, is less than the previous year. This to a certain extent can be accounted for by the shortage of water during the 12 months, in consequence of the long drought. The men working under their Miners' Rights have had a very bad time of it during the long drought. The same may be said of lessees holding sections. Now that the drought has broken up, and the supply of water being ample for all mining purposes, things are looking much better for all concerned.

A very large expenditure of money, over £50,000, has been expended by the three following Companies—Anchor, Liberator, and Australian—in the erection of most elaborate plants of machinery for treating the lode-stuff in the vicinity of Lottah and Blue Tier. I have no exact information as to the yield of this lode-stuff treated up to date, but it is generally reported that the yield is not exactly up to expectations. This applies to all three mines referred to. I must await further development before I can report as to the exact yield of tin ore from these mines.

The Golden Gate keeps up its reputation as a dividend-paying mine, and I am assured by the manager that the mine looks below ground as well as ever it has.

The Extended Golden Gate Company have reported that they have struck gold-stone at 900 feet, and the manager quite believes that he has struck stone in every way like the stone at the Golden Gate.

Prospecting is being actively carried on at Mathinna and the surrounding district. Some of these shows are reported to be very satisfactory. Without being over-sanguine, I am of opinion that further development will be satisfactory in the vicinity of Mathinna.

Mining for gold in the Mangana District is looking up. Mr. Goodall, manager of the Mangana Company, speaks very hopefully as to the prospects of that mine. I have seen some splendid stone from this mine. Mr. Goodall is now pushing on his adits, and is now crushing the stone at his battery, but I have not yet heard the result of the crushing.

The Salmon (an English company, of which Mr. Clerk is the Manager), has excellent prospects at a depth of some 80 or 90 feet, the stone showing gold freely. This company's ground is about 5 miles from Fingal, lying between the Mangana and Mathinna roads.

Prospecting is going on briskly in and around Mangana, and the prospectors appear to be very sanguine of success.

Coal-mining is now a settled industry in this District. The coal keeps of excellent quality, and the output is increasing. Both mines are fully employed, and are in excellent working order.

Mr. Commissioner HALL reports:—

There has been a considerable falling off in the amount of ore raised in the northern portion of the Western Mining Division during the last twelve months as compared with the previous year. This may be attributed, as regards silver-lead, principally to temporary causes, such as the cessation of work at the Oonah Mine while the concentrators were being erected, and the unfortunate destruction of the surface erections at the Comet Mine by bush fires. The district viewed as a whole is prosperous, and is growing rapidly in the value of its discovered mineral wealth. A good test of its prosperity is that the estimated population is nearly 16,000 for the Western Division, and there is no lack of remunerative employment for those able and willing to work. Many new discoveries have been made during the year which promise in the future to substantially increase the mineral output; but the last year's production has been mainly contributed by the same mines as in the previous year.

The total amount of silver-lead ore sent away from the Zeehan Railway Station during the year was 15,058 tons, value, approximately, £177,079, to which each of the following mines contributed £10,000 worth or over:—Montana, 3156 tons, value £42,531; Western, 3192 tons, value £38,304; Smith's Section, 1714 tons, value £21,731; Silver Queen, 1469 tons, value £13,406; Oonah, 884 tons, value £10,462. Other mines which have contributed in varying quantities are:—Mount Zeehan (Tasmania), New Mount Zeehan, Tasmanian Crown, Comstock, Montagu, Empress,

Silver King, Queen Extended, Wise's Section at Zeehan; and Comet, West Comet, M'Kimmie, Bonnie Dundee, Commonwealth, Fahl Ore, Rich P.A., Curtin-Davis, S.W. Curtin-Davis, No. 1 Curtin-Davis, and Kozminsky, at Dundas.

The Western Mine still has the deepest workings on the field, and has lately recommenced sinking the main shaft. It has been carried down to 540 feet, and will be taken on to about 640 feet before another level will be opened out. During last month a large quantity of the ore raised was stacked at the mine, and does not appear in the total amount sent away.

The Montana and Oonah Mines have completed and put in use their concentrators, and the Western Extended Mine has nearly completed its concentrator, which will make the tenth erected in the district.

At the Montana Mine the pumping and winding plant have been finished. The main shaft has been enlarged to 18 feet by 6 feet in 4 compartments, and is now down to a depth of 292 feet, and going down at the rate of 8 feet per week.

A tramway is about to be laid from the Zeehan Tramway Company's line to connect with the workings at Smith's section. This section is worked entirely by tribute and several sub-tribute parties. It would be probably managed more advantageously if all the parties were to follow the example set lately by a couple of them, and amalgamate.

In the Dundas District the mines are scarcely doing more than prospecting or early developmental work. With one or two exceptions none have begun to systematically produce ore. There are a great number of sections—more than a fair proportion—on which practically no work at all has been done. The Comet mine was unfortunate enough to have its surface buildings and over 30 feet of the main shaft timbers destroyed by bush fire in February last. Work below ground at once ceased, but, as the company have energetically begun repairing the damage, it is fair to assume that before long mining will be resumed.

The Hercules mine has prepared the formation for laying a line of rails for a self-acting tramway to connect the mine with the North-East Dundas Tramway at Deep Lead, the distance being about a mile. The rails are laid for the greater part of the way. The Mount Reid mine will have a short line to connect it with the Hercules tramway; the survey for it is now being done.

A large settlement has sprung up at Rosebery in anticipation of the mines developing there. It is understood that smelter machinery has been ordered for the Tasmanian Copper Company, and will be delivered some time after the end of the year, when the Waratah-Zeehan Railway is ready to carry it. Developmental work is being carried on in the other mines in this portion of the district.

Considering the nature of the country—its steep and thickly timbered hills and heavy rainfall—prospectors are pushing with commendable perseverance inwards from the older districts. New discoveries are being made every few days, but the work of development is woefully slow. That in rough country where means of access are so few and difficult is to be expected, but in the older portions of the district it is a pity that many lessees could not be induced to open up their sections instead of in so many cases allowing them to remain a considerable time idle.

It is probable that the coming year will see a most material advance in the prosperity of the district. The Tasmanian Smelting Company have commenced near Zeehan, about 1½ miles from the Zeehan Railway Station, the building of a smelter plant to carry three furnaces—two for silver-lead, one for copper. Railway connection with the Strahan-Zeehan Railway has been completed, and the excavations for the plant made. Building will commence very soon, and early next year the furnaces should be completed. It is anticipated that many mines which have large bodies of low-grade ore that cannot be profitably worked now will be able to resume operations and sell their products to the Smelting Company at a price remunerative to both parties.

Only about 60 ounces of gold have been purchased by the banks during the year. The quantity now being raised is practically *nil*.

No tin ore is being won. The low price ruling in the market does not offer sufficient inducement.

Mr. Commissioner Fowell reports:—

The Mount Lyell Company have continued steadily at work during the past year, and have shipped at Strahan over 5000 tons of blister copper. Six furnaces are now in blast, and four others in course of erection.

Prospecting work has been carried on vigorously at the North Lyell, Tharsis, and South Lyell, and, in the two former, very successfully. The other sections most notable are West Lyell, Prince

(No. 51.)

ANNUAL REPORT OF THE CHIEF INSPECTOR OF MINES.

Mines Office, Launceston, 19th July, 1898.

SIR,

I HAVE the honour to submit my Annual Report as Chief Inspector of Mines for the year ending June 30th, 1898.

Inspection of Mines.

During the year I have inspected the mines in the northern part of the Island as frequently as my other duties would allow, and have found them on the whole in satisfactory condition. All cases of fatal or serious accidents have been enquired into, but it has not been found necessary to take any legal proceedings, with the exception of the case mentioned in my last Annual Report, in which a conviction was obtained against a mine manager for allowing men to be raised and lowered on the bucket.

Ropes and cages have been examined and tested, and two of the former and one of the latter condemned.

At the begining of the year Mr. M. J. Griffin, of Gladstone, was appointed Inspector of Mines for the North-Eastern and Eastern Districts, which include the tin mines of the Ben Lomond, St. Paul's, Blue Tier, Derby, and Mount Cameron Districts, the coal mines of Mount Nicholas, and the gold mines at Mathinna, Mangana, Mount Victoria, and Warrentinna. In future these mines will be inspected regularly every three months.

Accidents.

The number of accidents, I regret to say, shows a still further increase. 13 men (all Europeans) were killed, and 32 Europeans and 1 Chinaman were more or less seriously injured. Total 46, as against 38, of which 7 were fatal, for the previous year. This increase is chiefly due to the great increase in the number of men employed, the average number of men employed in or about mines during the year ending June 30th, 1898, being 5533 as against 4303 during the previous twelve months. The causes of the accidents were as follows:—

Falls of Earth.—Three accidents, one fatal and two not fatal, happened through falls of earth in alluvial workings. The man who was killed, Edward Henry Allen, was working by himself on a tin claim, under a Miner's Right, when he was overwhelmed by a fall from the face, his body being found buried beneath about three feet of gravel and cement. Of the injured men, one was a European, who after having been warned, ventured too close to a high face when a fall was being taken down: he was caught by a portion of the earth and gravel and severely bruised. The other was a Chinaman who was working in a tail-race close to a vertical face, part of which fell and injured him rather severely. Sufficient attention is not paid to keeping working tail-races at a safe distance from high faces, and there is no provision in the Mining Act regulating this. The Inspectors have given frequent warnings, but it is difficult to make alluvial miners, especially Chinese, work with a proper degree of caution.

Falls of Rock, Timber, &c. in Underground Workings.—One man was severely hurt internally, and another sustained a compound fracture of the leg by falls of rock when working out the effects of shots in the Western and Tasmanian Copper mines respectively. While attempting to free a pass which had become hung up, at the New Golden Gate Mine, a man had a very narrow escape. The quartz started to run, and he fell away with it into the pass and was buried, but escaped with severe cuts and bruises. Three men were injured in the underground workings at the Mt. Lyell Mine, one at the Oonah, and one at the Ringarooma Mine, through pieces of rock falling on them. At the Montana Mine a man had his leg broken by a prop which he was attempting to land from the cage falling on it, and at the Tasmania Mine a man had his leg bruised by a piece of stope timber falling on it. Total, ten (10).

Fall of Coal.—One man had his hand badly lacerated by a fall of coal in the Mount Nicholas colliery. This is the only accident reported from the coal mines during the year.

Shaft accidents.—Four fatal and one non-fatal. Four of these accidents, three fatal and one not fatal, happened in the main shaft at the Tasmania Mine, Beaconsfield, but in none of the cases was any blame due to the management. The first accident happened to a man named Mark Lay, who was being raised to the surface in the cage with three other men, when he suddenly collapsed and slipped between the cage and the frame sets of the shaft, falling to the bottom, a distance of about 550 feet. The cage was provided with a bar about 3 feet from the floor as an extra protection, and it is surmised that the man fainted. In the pump compartment of the same shaft one of the pitmen, John Campbell, was using a bar, which suddenly slipped from its hold, and the man lost his balance and fell down the shaft, but was caught on the next platform, 25 feet below: he was severely shaken, and injured internally. Daniel Brown was assisting to land a long piece of timber, when he either slipped or stepped backwards into the shaft, and fell to the bottom of the shaft, a distance of 100 feet, being killed instantly. The barrier of the shaft had been temporarily removed for the purpose of landing the timber. The plat was well lighted by electricity, and no blame was attachable to any one. The fourth accident happened to a pitman named Richard Parry, who was cut in two by the tank, but there was no evidence to show how he got into the shaft. In this case the jury added a rider to the effect that a regulation should be

introduced to prevent men working alone in isolated parts of a mine. At the Silver Queen Mine, Zeehan, James Atters lost his life through falling off the staging in a shaft which he was engaged in skidding.

Foul Air.—Three men, Edmund Dillon, Edward Ryan, and James Wicks, lost their lives through being overcome by foul air in a small prospecting shaft at Port Cygnet. The shaft, which was on private land, was about 55 feet deep, and a start had been made to drive from the bottom. Dillon was in charge, with Ryan as braceman. He had noticed the presence of foul air (probably carbonic acid gas) on the day before the accident, and the weather was very sultry, which made it all the more likely for it to accumulate, yet he was lowered down the shaft without testing the state of the air. He fell off the rope before he reached the bottom of the shaft, and Ryan thought that the rope had been broken, not suspecting foul air. He obtained assistance and then climbed down the rope, but he, too, was overcome. A third man, James Wicks, then volunteered to go down, but refused to be tied on to the rope, and succumbed on reaching the bottom. It was not until then that any efforts were made to get rid of the bad air, and it was about three hours before the bodies were recovered. Thus three lives were sacrificed through ignorance or want of forethought.

Explosions.—The number of accidents due to explosions has been unusually large, two men having been killed and twelve injured. One man was killed and eight others injured through a heavy charge of powder, in one of the open cuts at the Mt. Lyell Mine, blowing into a drive in which the men were having "crib," the concussion forcing them against the timber and sides of the drive. At the North Mount Lyell Mine a man had his hand shattered by the explosion of a charge which he was getting ready. Two men were injured at the Commonwealth Mine by an explosion which took place as they were boring in the bottom of an old hole in which a charge of gelignite had been previously exploded: one of the men had his face terribly cut, but the other escaped with slight injuries. The practice of boring in the remains of old holes is a most dangerous one, and is forbidden by the regulations. In this case the offenders were proceeded against, and a conviction obtained. In the Montana Mine, Zeehan, a man had one of his eyes badly injured by a shot going off in a stope through which he was passing on his way to the shaft. A man named Thomas Snooks received fatal injuries at the Lyell Dundas Mine through the explosion of a charge which he supposed to have missed fire, and to which he returned after waiting only a few minutes. This is another dangerous practice, which the Inspectors have done their best to put down by frequent warnings.

Truck Accidents.—One man received slight injuries through getting his hand caught between two trucks at the Mount Lyell Mine; another man was injured internally through some of the trucks on which he was riding getting away on the Mount Lyell Haulage Line. At the Anchor Mine a man had his foot cut by the wheel of a truck while assisting to remove machinery.

Machinery in Motion.—One accident only happened from this cause: this was to an engine-driver at the Tasmania Battery, who got one of his fingers caught in the eccentric of the engine, and had to have the top of it taken off.

Struck by a Windlass Handle.—A man named Alfred M'Guinness received injuries from which he died six days afterwards, through being struck on the head by the handle of the windlass on Horton's Tribute, Smith's Section, Zeehan. He was lowering timber in the bucket, and proceedings were taken against the Manager for not providing suitable appliances for sending down timber, but the case broke down on a technical point. A similar accident, but not attended with serious injury, happened at the Tasmania Mine, Beaconsfield. A man was raising dirt from a winze, when the bucket caught in the skids, and the handle of the windlass was jerked from his hand, and struck him in the face.

Burst of Water.—Wm. Archer lost his life through a sudden burst of water and sludge in the Sylvester Mine as he was engaged with others in opening out a chamber from the shaft. The shaft was provided with a ladderway, but he was unable to reach it in time, the others barely escaping with their lives.

Other Causes.—One man had his thumb smashed by placing it on top of the drill which his mate was striking. At the Mt. Lyell Company's limestone quarry near Queenstown a man named Thomas Slade lost his life. He was working out the effects of a shot, when the rock on which he was standing fell away. A third man broke one rib and sprained his ankle through falling from an overhead tramway which he was helping to construct at the Florence Battery, Beaconsfield.

Mine Plans.—Information has been laid against several mine-owners for neglecting to furnish plans and sections of the underground workings, as required by Section 97 of the Mining Act, 1893, but further time has been given, and the cases have not yet been brought into Court.

Registration of Mine Managers.—There are still a good many mines of which the names and addresses of the mine managers are not registered. Circulars are now being sent to mine-owners, drawing their attention to the necessity for this, and unless this has the desired effect, legal proceedings will have to be taken.

The Reports of Inspector Harrison and Inspector Griffin are enclosed herewith.

I have, &c.

J. HARCOURT SMITH, *Chief Inspector of Mines.*

W. H. WALLACE, *Esq.*,
Secretary for Mines, Hobart.

Mr. Inspector HARRISON (stationed at Zeehan) reports :—

In forwarding my annual report I regret to state that the accident list is again a heavy one, being—Fatal, 6; serious, 11; not serious, 9.

Very few complaints have been made during the year; those received were attended to without delay.

The mines on the field are well equipped with safety appliances, which are tested as required; several ropes have been condemned.

We have 3 magazines at Zeehan, 1 at Ringville, 1 at Queenstown, and 1 at Gormanston; they are at present in a clean condition. I destroyed 5 cases of damaged explosives during this term.

Legal proceedings were taken in three instances, one against a manager for not providing suitable appliances for lowering timber, the others were endeavouring to drill out miss-fires. The former I lost on a technical point; a verdict was obtained on the others.

During the year there has been a slight falling-off in the output from the Zeehan field, the principal cause being the destruction by fire of the Comet plant last summer. I am happy to say the Directors of that company have lost no time in providing fresh and powerful machinery, the erection of which is nearing completion; pumping will soon be resumed. The Western Mine is still keeping up a good output; within the last few weeks there has been a decided improvement in some of the deeper levels. During the year the Montana has erected a good dressing-plant, also powerful pumping and winding gear, capable of going to a depth of 1000 feet. The shaft is being pushed down as fast as possible. The mine is looking well throughout, and has a couple of years' ore in sight. At the Oonah a dressing mill has also been erected, which is doing good work, and there is another in course of erection at the Western Extended.

The splendid smelting works now in course of erection will no doubt give a considerable impetus to mining, by affording facilities to quite a number of Companies for the disposal of their ores that cannot at present be exported to advantage. This not only applies to several of the silver-lead mines in the immediate vicinity, but also to numerous mines in the Ring River, North-East Dundas, and Mount Reid Districts, where large bodies of pyritic ores are being opened up.

In the Lyell District the Mount Lyell Company are opening up an immense body of ore. They are keeping six 100-ton water-jacket furnaces constantly going, and have five others in course of erection. The North Lyell and Lyell Tharsis are both opening up well; the same can be said of several of the adjoining mines. It only requires the completion of the railway to Kelly's Basin to make this district a wonderfully productive one.

Several new finds have been made along the proposed line at Mount Jukes and Mount Darwin.

The Mount Murchison District is attracting considerable attention at present through the fresh discoveries that have been made at Red Hills, Moxton's, &c., the chief obstacle to the development of this field being the want of rail communication. Indeed, from nearly every point of the compass most encouraging reports are coming in, and I confidently look forward to the West Coast becoming one of the largest ore-producing districts in the Australian Colonies.

Inspector GRIFFIN (stationed at Gladstone) writes :—

I have the honour to report having commenced my duties as Inspector of Mines for the Eastern and North-Eastern Mining Divisions in February of the current year.

All underground mines being worked, as also all deep-faced mines working for alluvial tin, were visited and inspected in March, and again in June, of this year.

One accident of a rather serious nature occurred by which a man (European) had his hand badly crushed by a fall of coal; this accident appears to have been unavoidable, and no blame is attachable to anyone.

One or two complaints of a trivial nature were received, and attended to.

Cages and ropes have been practically tested, and several of the latter condemned, also one cage on account of a defective spring on the spindles of the eccentric grippers.

The careless handling and storing of explosives in many of the mines is a practice to be condemned. I have frequently found both gelignite and caps or detonators placed together within a few feet of a travelling road or working face; contractors appear to be the chief offenders in this direction, and since frequent cautioning is of no avail, more stringent measures will have to be resorted to.

In quite a number of mines, especially the smaller ones and prospecting shows, proper ladder-ways, as required by Regulation XXIII. (Section 122) of the Act are not provided; in many cases a sort of ladder is fixed in such a way as to be rather a source of danger than otherwise to those for whose use it is provided. All defective ladders have been condemned, and those in an overhanging position ordered to be altered or replaced, if necessary, by new ones.

Great laxity is still shown by many of the mine-owners in the matter of registering their mining managers, as required by Section 91 of the Mining Act of 1893. It not unfrequently happens that a mine is inspected where the work of shaft-sinking or even driving is being carried on without any responsible person being appointed to supervise the work. Owners often save the cost of managing by letting their mine to tributors or contractors; these latter are careful not to take any responsibility when interviewed by the inspector. Circulars, giving a final notice to all mine-owners who have neglected to comply with Section 91, are now being issued, and I beg to recommend that prompt compliance with the Act in this direction be insisted on, otherwise the work of inspection cannot be effectively carried out.

The ventilation of the mines inspected is generally very good; some few exceptions, however, are to be met with, where proper attention is not given to this matter, and where other sanitary precautions are neglected, all of which have been noted and commented on.

On the whole the mining interests on these fields may be said to be entering on a more prosperous era. After a year of unprecedented drought, affecting alike the gold-mining as well as the tin-mining industries, the long-looked for rain came in April, and by the end of the following month an abundant supply of water was obtainable all round.

In the vicinity of Derby, the Briseis, Brothers' Home No. 1, and Brothers' Home Extended Tin Mining Companies, as also the Brothers' Home—private mine—are in full swing, sluicing on good tin-bearing grounds, and good outputs of tin may be expected from these mines ere long.

A head-race, several miles in length, is being constructed from an off-take on Main Creek, from which stream it is intended to supplement the at present inadequate supply of the Briseis Tin Mine.

The Brothers' Home Extended Tin Mining Company (north of river) are also having a head-race constructed to bring water on to their mine from Main Creek. A substantial column of 18 inches diameter flanged pipes is being laid to carry the water across the Ringarooma River near Main Creek junction, from which point it will be conveyed to mine by means of earth-channel. Both these water schemes will give a good head or pressure to their respective mines, but it is questionable if the supply available from Main Creek at any season will prove sufficient to be divided between two large mines such as the Briseis and Brothers' Home Extended.

Mr. Sheard, C.E., is now having punts built to carry a hydraulic dredging-plant intended to be used for dredging and sluicing the tin-bearing gravels confined to the river-bed in the vicinity of Derby, also the deposits of river and adjacent flats lower down. There is no reason why hydraulic dredging, such as is being successfully carried on for gold in the other colonies, especially at Yackandandah, in Victoria, should not be applied to the profitable raising and treating of the tin sands and gravels that exist in the river-bed and adjacent flats of the Ringarooma, from Derby to the sea, a distance of over 40 miles on the course of the river.

At Pioneer and Gladstone tin-mining had almost come to a standstill, owing to the great scarcity of water and the low state of the tin market. This state of affairs, I am glad to say, no longer exists. There is now a plentiful supply of water. The tin market has already reached £72 10*s*., this quotation being the highest for the past four years (in October, 1896, tin was as low as £57 10*s*. in the English market), and the outlook is altogether brighter. The alluvial tin deposits of the Gladstone Field are very extensive, and, although not rich, can be made to pay when the market price of metallic tin is not less than £70 per ton.

In the vicinity of Lottah there are three big companies at work. At the Anchor Mine a very extensive tin-dressing plant—comprising a 100-head battery, with classifiers, jigs, frue vanners, and buddles, all of the most approved type for drilling and dressing tin-ore in large quantities—has been erected. Two stone-breakers—one "Gates' No. 4," and the other a "Blake-Marsden"—are in use for reducing the stone to a size suitable for feeding to the battery. The whole of the machinery, including an air-compressor for rock-drill, and dynamo for electric lighting, is driven by water-power, operating on Pelton wheels. A more complete plant for the economical milling and treatment of lode tin it would be difficult to find anywhere. From figures furnished by the Manager it is shown that the total cost of quarrying, crushing, and dressing the stone does not exceed 4*s*. per ton, which is equivalent to paying all working expenses with half (½) per cent. stone, allowing the tin ore to be worth £40 per ton on the ground, which is about the present price. Only one battery—50 heads—is being worked at present. Unfortunately for the

owners, the prospects of obtaining even the half per cent. required to pay expenses on this mine are not good at the present time, but the manager is hopeful of obtaining better results as the face of the quarry is advanced into the hill, and also extended to the full width of the tin-bearing porphyry. The two faces at the lower or main working level are nearly connected; when this is done the whole will represent a continuous face nearly the full width of the tin-bearing formation. No rock is rejected, as the intention is to thoroughly open up the mine, sending everything to the battery. Indeed it would be a difficult matter to class the stone, as any tin visible may be found in portions of the lower and harder rock as readily as in the softer superficial porphyry.

Liberator Tin Mine.—The crushing and dressing plant on this mine comprises a 20-head battery, two classifiers, 8 double jiggers, 10 frue vanners, and 2 running concave buddles. The transit of the rock from the quarry to the battery—a descent of 400 feet vertical—is by means of a self-acting tramway, the trucks delivering directly into the hopper of the stone-breaker, where the larger lumps are reduced by the breaker to a suitable size for the mechanical battery feeders; thus the stone passes from the mine to the battery, is crushed and treated, without re-handling, and at the smallest possible cost per ton. This is a model plant, well planned, and most substantially constructed. The whole of the machinery, including dynamo for electric lighting, is driven by two Pelton wheels, under a 400 feet head of water. The working face of this mine is opening up on the south side and near the top of a small rounded hill, and is intended to be carried forward in a northerly direction. The tin-bearing area, which is a quartz porphyry, same as the Anchor formation, extends over about 6 acres of the hill top. The rock over about one-third of this area has been bared by ground-sluicing, from which good results are said to have been obtained. The rock in the face now being opened up close to the top of the self-acting tramway is very hard and poor in tin. Better results are obtained about 200 feet further west, where a second face at the same level, and eventually intended to connect with the first-mentioned, is being worked. The superficial rock at the latter face is more decomposed than at No. 1, and shows fairly good tin in places. A shaft 12 feet was put down to test the rock in advance of No. 1 face, and good payable tin obtained in the first 8 feet from the surface. Here, as at the Anchor mine, the intention is to thoroughly open up the tin-bearing porphyry by extending the working face to the full width of the formation. This is a system to be commended in the working of any mine where the metal or ore is sparsely disseminated through the rock. It is a matter for regret that more has not been done to test the value of these deposits to greater depths, as it is evident—especially in the case of the Anchor mine—that the "tin floor" has not been reached.

Australian Tin Mine, (Puzzle).—Steam-power is employed for driving the machinery at this mine. A 30-head battery is in use for reducing the stone. The dressing appliances are somewhat different from the Anchor or Liberator plants, being more of the Kayser (Bischoff) type. The stuff from the battery goes through classifiers of the Spitzbutten make, thence through double jiggers, the slimes, or fine ore, being treated on convex rotating tables. The working-face (open cut) is in the quartz-porphyry formation at an elevation of about 700 feet above the battery site; the stone is sent down by means of a self-acting tram of the ordinary kind for the first hundred yards or so, from which point a sort of hybrid tram, half aerial, half ground-line, is in use, but does not appear to give satisfaction. This portion of the line is about 700 yards in length. The prospects of success in this mine would be greatly enhanced by a better system of working, and the introduction of water as a motive power. The stone is said to be fairly rich, giving from 1 to 1½ per cent. It was, however, rather poor at the time of my last visit.

Scamander River.—The only mine working in this locality was the Eastern Proprietary Copper Mine, where prospecting work has been carried on by three or four men since the beginning of the year. Operations have now ceased altogether.

Coal Mines.—The Mt. Nicholas Colliery, also the Cornwall Mine, have been visited and inspected twice since January last. In the former, work is carried on on the "longwall" system, which is more expeditious and profitable to the owners, but not so safe for the men employed as the "Pillar and Bord" system of working carried on at the neighbouring Cornwall Colliery. Sufficient attention to timbering and ventilation has not been given in the past to the workings of the Nicholas Colliery. A down-throw fault has just recently been met with in this mine that will, in all probability, necessitate the opening up of new works. The course of the fault is from east to west, depth of down-throw about 3 feet.

At the Cornwall Colliery work is progressing in a satisfactory way. The bush fires in February last destroyed the manager's residence, and great difficulty has since been experienced in keeping the fires, which have taken a firm hold of the slack heaps, from destroying the tramways, or, even worse, getting a hold of the coal seam on the out-crop. Fires are still burning in the slack heaps at both collieries.

Coal discoveries on East Coast.—Seymour and Bicheno were visited in June for the purpose of inspecting the new coal discoveries made by the Morning Star Company. Unfortunately, the work of prospecting had just ceased on the day prior to my arrival, and I was unable, for want of a guide, to visit more than one place where prospecting had been done.

The Morning Star discoveries, which are all above sea-level, extend from Picanini Point, ut 3 miles north of Seymour, to Llandaff, 8 miles south of Bicheno, a total distance of about miles. Good coal is said to have been obtained more than 50 years ago by the Douglas mpany, whose colliery was situated on the flats on the bank of the Denison River, six (6) miles rth of Bicheno, and close to the seashore. A tramway was constructed from the colliery to cheno, from whence the coal was shipped. Very little is left to show the position of this npany's workings, but in all probability the seams worked were below sea-level. Six miles further rth is the site of the East Coast Coal and Harbour Company's workings, at Seymour: here also workings were in the flat, not far from the seashore. Coal of good quality for domestic purposes, t not fit for coking, was obtained.

The following information, furnished by Mr. Surveyor Mason, will give some idea of the orning Star discoveries:—

"F.—Claim at Llandaff—thickness of seem, 3 feet 6 inches; height above sea, 400 feet; adit in feet, horizontal; coke test—fixed carbon, 55·5; gas, 33·75.

"A 1.—At Steep Creek, 5 miles south of Bicheno—thickness of seam, 3 feet 2 inches, slight to south; adit in 50 feet; above sea, 520 feet; coke test—fixed carbon, 56·20; gas, 27·0. ere are 17 seams of coal at this place, A 1 being the third seam from the top.

"B 1.—On Denison River, 6 miles north of Bicheno, two miles west from sea—an old adit put some years ago for Mr. Thomas Bateman.

"B 2.—New adit in 65 feet on same seam as B 1. This seam is about 275 feet above sea-level, d not far west of the old Douglas Company's workings before referred to. The river at this ice falls rapidly, consequently the coal seam, which is apparenly horizontal and on a level with the er water at the entrance of B 2 adit, is high above the stream further east, and of course is lost ht of altogether in the opposite direction, or west of the adit. The floor of the adit was covered th 4 or 5 inches of water, backed from the River, at the time of my visit. I am therefore able to say for certain what the nature of the floor is at the inner end of the adit. At the trance it is a hard sandstone roof and floor.

"*Description of B* 2.—Beneath roof, 20 inches good coal, 2 inches bushing or white band, inches mixed coal, 6 inches clean coal, with from 6 to 8 inches of clay "holing" at bottom. The -in. seam is a bright bituminous coal, save a few thin mud layers, and should be a good coking al. The 6-in. layer, in same seam, is also of good quality. The floor is wavy or undulating, but the whole will be found fairly horizontal, that is so far as can be judged from the limited extent the work done. There are several other seams higher on the range than B 2, varying in ickness from 20 to 30 inches. A test made by Launceston Gas. Co. of coal from B 2, as lows:—Gas made per ton of coal, 10,800 cubic feet; coke, 13 cwts. 3 qrs. 22 lbs."

Of the various other discoveries made by the company I was only able to obtain sparse formation. There can be but little doubt of the good coking quality of the coal obtained at andaff, Steep Creek, and the Denison River. Further exploration will show whether the apparent ilities for working can be put to the practical test. The dip—if any—of the seam is in such direction as to prevent the drainage of the mine by adit working, is one consideration. Sufficient oling" or soft underlayer to allow of these shallow seams being worked without cutting the roof floor rock must also be considered. As to the shipping of coal, the distance from the Denison Cole's Bay seems a little too far.

Mangana.—The principal mine at this place, and the only one producing gold, is the Mangana old Reefs Company. The mine is worked by 4 adit levels, in each of which the lode is of a good ickness up to No. 4, near the top of the hill, where it opens out into an immense body of stone out 25 feet across. Some rich specimens have been taken from this, but the gold does not appear be disseminated through the whole mass. The facilities for working this mine are exceptionally od, and when the new crushing and concentrating plant proposed to be erected is finished, good yable results should be obtained. On the whole the state of the workings were found in satisctory condition.

Robertson's Freehold.—This is a prospecting show on Specimen Hill, close to the township on e west side. A shaft, 6′ 6″ × 3′ is down 135 feet, opened out at 120 feet, and crosscut 30 et. A number of gold-bearing leaders have been cut. Hauling by means of a whip, shaft nbering, ladders, and rope in good order. No mining manager appointed for this claim.

Great Unknown.—Situated about 1½ miles west of Mathinna Road, nearly opposite the alahide Estate homestead. Underlay shaft down on lode 65 feet; a good body of stone 8 feet in ickness, gold prospects fairly good. Two men employed. Works in good order.

Salmon Gold Syndicate.—Fairly good progress has been made at this mine since my last visit March. North main level adit in 380 feet, 200 feet to go to cut reef at shaft level, 180 feet low surface. The reef as shown in the shaft at this level has pinched a little, but there is still a od body of stone showing gold freely. A good site has been chosen on the sloping ground outle entrance of main adit on which a battery is to be erected. The prospects of success for this ine are first-class, workings in good order, careless use of explosives only cause of complaint.

New Golden Gate.—This mine needs no comment. To say that it is in its usual flourishing state is sufficient. The works on the whole are in good order. Safety-cages were tested, and one condemned on account of a defective spring on eccentric spindle.

Gate Extended.—Work in cross-cut west from shaft only. This is now extended a total distance of 760 feet from the shaft. Ventilation not very good. Cages and ropes tested and found all right.

North Gate Mine.—Shaft sinking, also cross-cutting from 900-feet level. A good body of payable gold-bearing stone was cut in the shaft at 917 feet on the day of my arrival (23rd June). This is only a fitting reward for plucky perseverance on the part of the owners. To strike gold at any level is good, but to get it in a large body of stone 900 feet below the surface is a magnificent result, not only for those directly interested, but for mining in general throughout the Colony. The workings of this mine are in good order. Ordered a safety-hook to be used on hauling-rope to prevent accident through overwinding.

Jubilee Mine.—Cross-cut from shaft 20 feet east, and drive on lode formation north 40 feet. Country very hard; four men employed. Machinery and everything about this mine in good order.

The October, Mabel, and *Record Mines,* about five miles north of Mathinna, were visited. Nothing worth recording in connection with the prospect of these. Their style of working is none of the best.

Hickson's Gold Mine, in the same locality, has been idle for some time, but is now about to resume work.

Alberton, Mount Victoria.—Mercury Gold Mine.—Driving No. 3 adit, which is now in 134 feet, is the only mining being done. The work of repairing the old water-wheel and erecting a new 10-head battery is nearly completed, and mining and crushing stone from the old upper levels will be proceeded with in a short time. Good results are expected.

Ringarooma Gold Mine.—Work at this mine is now in full swing. Battery stone is being obtained from South Rosalind on course of lode known as No. 3 Gumsucker. Some very rich stone is obtained from this part of the mine, and a more expensive crushing-plant is all that is required to obtain first-class results. The 10-head battery driven by water-power is altogether too small for a mine of such promise as the Ringarooma. Everything in connection with the mine and workings found in highly satisfactory condition.

Bright Star Company.—About 16 tons of stone at grass ready for trial crushing. No work being done in mine at present.

Alberton Mine.—Shaft down 104 feet. Ladderway and centreing unsatisfactory. It is to be hoped that the new manager now about to take charge will improve matters at this mine.

Warrentinna.—Derby Gold Mine.—Very little work being done here; work at main tunnel abandoned. Ladders ordered to be renewed in shaft on south section, also new windlass-rope to be procured before work of driving on course of lode at 95-feet level is proceeded with. Only two men employed.

East Volunteer.—Main adit in 915 feet; 165 feet to go to cut "Blue Reef."

Coronella Mine.—No work at present, pending the crushing of a quantity of stone at the East Volunteer battery.

ANNUAL REPORT OF THE GOVERNMENT GEOLOGIST.

Government Geologist's Office, Launceston, 18th July, 1898.

SIR,

I HAVE the honour to submit my Annual Report as Government Geologist for the year ending June 30th, 1898.

The following Reports have been prepared and forwarded to you:—

On the Mineral Field in the neighbourhood of the Minnow River.

On an alleged discovery of Coal-bearing Strata in the vicinity of Quamby's Bluff.

On the Mineral Fields in the neighbourhood of Mount Black, Ringville, Mount Read, and Lake Dora.

In October last, according to instructions from the Honourable the Minister of Mines, I compiled a short pamphlet on the mineral industry of the Colony, and since then have prepared a supple-

mentary report at the close of each quarter. As there is no statistical staff in connection with the Mines Department, it is exceedingly difficult to obtain complete and accurate returns from all the mines. I would respectfully suggest that it be made compulsory on all mine-owners to furnish detailed quarterly returns, showing the quantity and value of the minerals or metals obtained, value of machinery and plant, average number of men employed, &c.

Geological Survey.—I am of opinion that much good would result from a detailed geological survey of the Island, especially of the West Coast Districts, but it is impossible to do this under present circumstances. It would require the undivided attention of two or three men, and very little satisfactory work can be done until a proper topographical survey has been made.

In the charts of the mineral fields issued by the Mines Department, the tracks, rivers, mountains, &c., are as a rule only sketched in, and they are sometimes very misleading. Sections are often applied for remote from any previously surveyed blocks, and, as a connecting traverse would be very troublesome owing to the broken nature of the country and the generally dense bush, an independent survey is made, starting generally from the magnetic meridian at a point whose relative position is only approximately known. When the intervening sections are surveyed and plotted it sometimes happens that the positions of mountains, rivers, &c., as shown on previous charts have to be shifted several miles.

Diamond Drills.—Neither of the two diamond drills have been in use during the year, but several enquiries have been made about them. No. 1 Drill has lately been thoroughly overhauled and is likely to be soon at work, but No. 2 Drill, which is at Zeehan, is in a very bad state of repair.

I have the honour to be,
Sir,
Your obedient Servant,

J. HARCOURT SMITH, *B.A.*, *Government Geologist.*

W. H. WALLACE, *Esq.*, *Secretary for Mines, Hobart.*

REPORT OF THE MOUNT CAMERON WATER-RACE BOARD FOR THE YEAR ENDING 30TH JUNE, 1898.

1st July, 1898.

SIR,

WE have the honour to present the Report of this Board for the year ending the 30th June, 1898.

This Board has met as frequently as occasion required.

The staff consists of a Manager and three watermen and channel-keepers.

The duty of the Manager consists of the entire charge and supervision of the Race, which, with its branches, is thirty-three miles in length. He keeps all accounts, weighs the tin raised under the royalty system, and collects and accounts for the royalties thereon, prepares plans and specifications for all works of construction and maintenance, levels head and tail races for customers when required, and generally manages and supervises all matters connected with the safety and efficiency of the Race. His salary is £200 a year, with forage allowance £50, and a cottage. He is expected to keep a horse, which is partly used for conveying tools and materials used on the works.

The duties of the watermen and channel-keepers are to distribute water to the customers, to do all work necessary, night or day, for the preservation of the safety of the Race, and for cleaning and keeping the same in order. Their duties are of a responsible nature, and any neglect of them would involve the Board in a loss which might entail hundreds of pounds to make good.

The flumings upon the old portion of the Race, which, owing to the advanced state of decay into which they had lapsed, were the cause of a very considerable and increasing loss of water, and consequent diminution of revenue, have now be replaced by earth-channels, and the Race is now in fairly good order. This work has been somewhat costly, but no doubt it has been true economy to have undertaken it, and the cost of maintenance has been much lessened.

Up to the year 1897 the Race has always been able to pay a balance, over and above the amount required for maintenance, to the Public Debts Sinking Fund. Last year, owing to the low price of tin, the stoppage of water for certain periods while important construction work was been carried on, and to the exceptionally dry summer and shortness of water, the Race did not quite pay working expenses. Certain reductions in the cost of management have now been effected, which will save the Government £162 10*s.* yearly. The Manager's salary has been reduced by £100, and the wages of one waterman (who is at the extreme end of the Race and, is seldom called upon to do more than turn the water on in the morning and off again at night), has been reduced from 8*s.* to 4*s.* per diem; he is, however, allowed to perform private work during such part of the day as he is not required by the Manager.

Having in view the recent depressed state of mining and consequent low revenue from the sale of water, the Mount Cameron Water-race Board does not consider it desirable to offer the Race for sale at the present time, but to defer the sale until tin-mining becomes more prosperous, and this may be reasonably looked for through the enhanced price of tin. Any proposed offer of the Race for sale should, in our opinion, be accompanied by mining concessions in the way of the reservation of a large area of mineral-bearing land for the use of the purchaser.

The Statistics for the year are as follows:--

Average per week of claims supplied	15
Greatest number supplied in any one week	19
Present number supplied	19
Total number of heads of water supplied	3901
Tons of tin ore raised	90 tons 11 cwts. 19 lbs.
Average number of miners employed—13 Europeans; 37 Chinese	50

	£	*s.*	*d.*
Total receipts for the year	629	0	0
Cost for maintenance and management	729	18	10
Paid to Public Debts Sinking Fund, 1897	*Nil.*		
Total cost of purchase and construction	34,572	19	0

W. H. WALLACE, *Chairman of the Board.*
C. O'REILLY,
J. HARCOURT SMITH,
S. HAWKES,
JOHN SIMPSON, } *Members.*

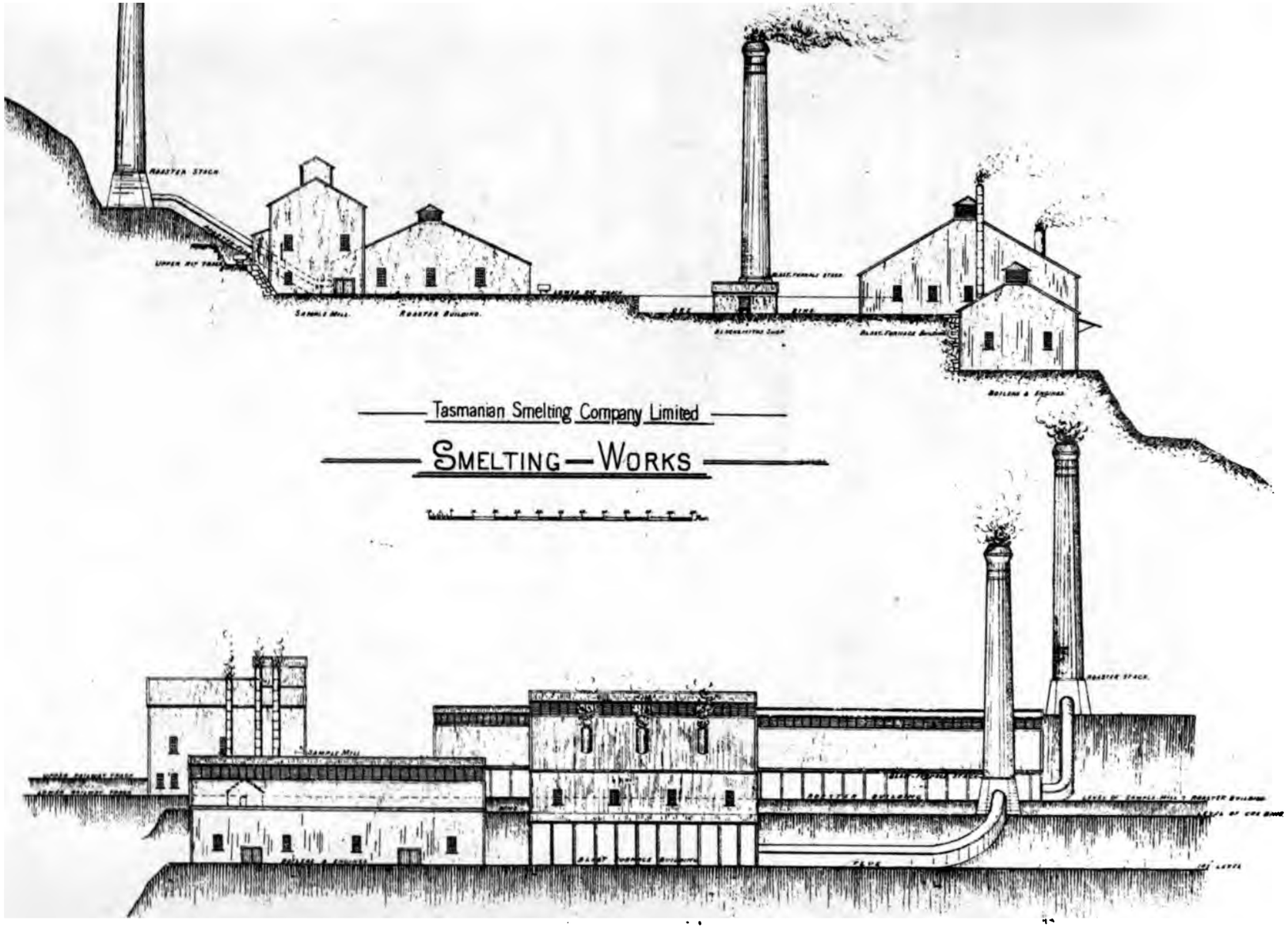
TASMANIAN SMELTING COMPANY, LIMITED.

As the result of the investigations made at the end of 1896 and beginning of 1897 by Mr. Haber, on behalf of the Deutsche Bank, Berlin, and Mr. W. Schmidt, on behalf of the Metallgesellschaft, Frankfort a M, the Tasmanian Smelting Company, Limited, was organised for the reduction of the ores of the Zeehan field and adjoining districts, and a Manager engaged for the immediate erection of the works.

The Company is registered in London, with a capital of £85,000, and has the following Board of Directors:—M. Steinthal, Esq., Berlin; M. van Gember, M.E., ditto; A. Goerz, Esq., London; Z. Hochschild, Esq., Frankfort a M.; Walter Schmidt, Esq., M.E., Melbourne. Max Heberlein, Zeehan, Tasmania, is General Manager, and Mr. H. Militz, London, Secretary of the Company.

The rapid advance in smelting made in the United States during the last few years caused the engagement of a metallurgist with American experience, and Mr. Heberlein arrived on the field in November, 1897.

After a delay of several months for the proper adjustment of preliminaries, active operations were commenced on the smelters. The site is situated some two miles south of the town of Zeehan, on the Zeehan and Strahan line of Government railway, on the slope of a hill in the immediate vicinity of extensive limerock deposits, which were previously acquired by purchase.


Tasmanian Smelting Company Limited
SMELTING—WORKS

The slope of the hill permits the application of terrace arrangement, by which all materials are handled by gravitating towards their final depositions. This arrangement called for heavy excavation for the building, and an expensive railway connection of some distance in order to obtain the proper delivery of all materials on their respective levels. The grading for the works was commenced on beginning of March, that of railway on April 1st. All this work has been completed, and the delivery of building materials, which was utterly impossible without a railway track, commenced, so that the actual construction is under full swing.

The accompanying plans plainly show the situation of buildings. The sulphide ores are delivered on upper track to the sample mill, capacity 100 tons per shift, or, in the case of concentrates, to the sulphide bins direct. The crushed sulphides go to their respective bins. These bins are 5 feet below railway track, on level with top of calcining furnaces, of which 7, 72 feet long by 17 feet wide, are provided.

The lower track is 13 feet below the upper, on level with sampling-mill floor and roaster building. Oxide and such ores which do not require crushing, fluxes, fuel, &c. &c., are delivered on this track in such manner that wood goes directly to the places of consumption, while other material is discharged into an arrangement of bins, which allow the least possible inconvenience in handling, and give ample room for storage and bedding of the different ores.

This bin-room is on blast furnace charge-floor level, 7 feet below lower track level, and measures 150 feet × 350 feet. The blast-furnaces, three in number, of an aggregate capacity of 250 tons ore per 24 hours, are situated on the lowest level, 25 feet below bins and charge-floor. On the same level are the boiler and engine-houses and machine-shop. The disposal of slag and refuse is facilitated by a "dump" of 45 - 80 feet in height. In addition to the above buildings, commodious offices, laboratory, storehouse, blacksmith's shop, bath-house for employees, and cottages for the staff, are provided. A double haulage-line will connect the bins with the limerock quarry and woodyard, and also deliver the products, silver-lead bullion and copper mattes, to the railway main line.

The works will be far enough advanced to receive ores as soon as the necessary storage-room is completed.

The materials of construction have been contracted for, and nearly all machinery, which comes from best shops of their respective line, is now *en route* from the United States and elsewhere.

The whole plant is so arranged as to permit an increase of capacity without change in its systematic working at a small expense, spare engines, blowers and boilers being already included in present construction.

Two brick chimney stacks connected by flues and condensing chambers to calcining and blast furnaces will carry the fumes above the crests of the surrounding hills, and are of sufficient size to accommodate future additions to either department.

The water supply is derived from a creek at bottom of slag-dump, and pumped by compound steam-pump through a system of water-mains with branches, which not only furnishes a continuous supply to the different departments, but gives efficient protection against fire, the minimum pressure being 60 feet over the height of most elevated buildings. The general stores are kept in a magazine situated between upper and lower track at their junction.

The completion of these works means very much for the Zeehan, Dundas, and Mt. Reid districts. No pains have been spared to make it an up-to-date smelting-plant for the reduction of customers' ores. The machinery is all of approved and most modern type to ensure efficiency and economy, and this, with the financial standing and the experience with enterprises of such dimensions, will surely prove a benefit to the West Coast and to the whole of the Tasmanian Colony. Already the stimulating effects of this first and only silver-lead smelter in Tasmania are felt, and the semi-monthly pay-days are welcomed by merchants and business-men in general. The natural increase in population will greatly benefit other portions of the Colony as well, as the market for their products is enlarged by new consumers, not only the men directly employed by the Tasmanian Smelting Company, Limited, either at their work or in the bush, but also by the additional employment of miners opening new properties by finding a cash sale for heretofore valueless products.

DIAMOND DRILLS.

Statement of Work done to 30th June, 1898.

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance bored.	Average cost per foot, inclusive of Labour and Fuel.
	No. 1. Drill.			feet.	£ s. d.
1882-3	Back Creek—For Gold	Vertical	7	1330	0 10 9
1883	Lefroy—For Gold	Ditto	4	1011	0 5 3
1884	Tarleton—For Coal	Ditto	1	401	0 5 6
1886	Longford—For Coal	Ditto	2	1585	0 4 0½
1886-7	Harefield Estate—For Coal	Ditto	1	725	0 6 5
1887	Cardiff Claim, Mount Malcolm—For Coal	Ditto	1	562	0 17 11¾
1888	Killymoon Estate—For Coal	Ditto	1	504	0 4 7¼
1888-9	Seymour—For Coal	Ditto	5	2266	0 7 8½
1889 } 1890 }	Beaconsfield (Phœnix G. M. Co.)—For Gold	Ditto	1	781	2 0 2
1890	Beaconsfield (East Tasmania G. M. Co.)—For Gold	Ditto	1	978	0 14 9½
1891	Spring Bay—For Coal	Ditto	4	937	0 6 10
1891	Ravensdale—For Coal	Ditto	1	114	0 11 1½
1891-2	Back River, Prosser's Plains—For Coal	Ditto	2	854	0 6 1¾
1892-3	Lefroy (Deep Lead Syndicate)—For Gold	Ditto	4	979	0 15 9
1893	Lefroy (East Pinafore Co.)—For Gold	Ditto	1	317	0 10 3
1895-6	Sandfly—For Coal	Ditto	4	2130	0 11 5
	Total		40	15,474	
	No. 2 Drill.				
1882	Beaconsfield—For Gold	Horizontal, underground	1	68	No record.
1883	Mangana—For Gold	Ditto	1	546	0 15 1
1884	Guy Fawkes Gully, near Hobart—For Coal	Vertical	1	612	0 5 6
1885	Malahide Estate, near Fingal—For Gold	Ditto	5	1397	0 5 6
1886	Carr Villa, near Launceston—For Coal	Ditto	1	571	0 5 4
1886-7	Waratah (Mount Bischoff Alluvial T. M. Company)—For Tin	Ditto	7	1548	0 6 1½
1887	Waratah (Mount Bischoff T. M. Co.)—For Tin	Ditto	7	841	0 11 8
1887	Ditto	Horizontal, underground	1	53	0 7 8
1888	Old Beach—For Coal	Vertical	1	593	Abt. 0 10 9
1888	Campania—For Coal	Ditto	1	600	0 7 7½
1888	Richmond—For Coal	Ditto	1	500	0 5 1¾
1889	Back Creek—For Gold	Ditto	4	787	0 8 5½
1891	Macquarie Plains—For Coal	Ditto	2	989	0 4 5½
1891	Jerusalem—For Coal	Ditto	1	344	0 4 9¾
1892	Langloh Park—For Coal	Ditto	4	1249	0 5 3¼
1893	Southport—For Coal	Ditto	1	612	0 5 3
1894	Zeehan (Tasmania Crown S. M. Co.)—For Silver	Horizontal, underground	2	319	1 0 2½
	Total	...	41	11,629	

Aggregate number of bores 81
Total distance bored ..... 27,103 ft.

J. HARCOURT SMITH, *B.A.*, *Government Geologist.*

Launceston, *27th July*, 1898.

No. 1.

COMPARATIVE Statement of Gold won during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, *and the first Half-year of* 1898.

YEAR.	QUANTITY.	VALUE.
	ozs. dwts.	£
1880	52,595 0	201,297
1881	56,693 0	216,901
1882	49,122 6	187,337
1883	46,577 10	176,442
1884	42,339 19	160,404
1885	41,240 19	155,309
1886	31,014 10	117,250
1887	42,669 3	158,533
1888	39,610 19	147,154
1889	32,332 13	119,703
1890	20,510 0	75,888
1891	38,789 0	145,459
1892	42,378 0	158,917
1893	37,687 0	141,326
1894	57,873 0	217,024
1895	54,964 0	206,115
1896	62,591 0	237,574
1897	77,131 0	296,660
1898 for first half-year	29,599 10	114,175

No. 2.

RETURN showing the Quantity of Gold obtained from Quartz during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, *and the first Half-year of* 1898.

YEAR.	QUANTITY.	VALUE.
	ounces.	£
1880	34,345	130,622
1881	45,776	174,956
1882	36,215	137,183
1883	36,672	138,060
1884	30,540	114,630
1885	33,266	124,234
1886	25,004	87,516
1887	33,427	123,453
1888	34,156	126,139
1889	33,069	116,517
1890	17,829	64,184
1891	33,659	126,221
1892	34,386	128,947
1893	30,163	113,111
1894	52,239	195,896
1895	51,628	193,605
1896	59,453	222,948
1897	74,937	288,432
1898 for first half-year	28,464½	109,919

No. 3.

QUANTITY and Value of Coal raised during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, *and the first Half-year of* 1898.

YEAR.	QUANTITY.	VALUE.
	tons.	£
1880	12,219	10,998
1881	11,163	10,047
1882	8803	7923
1883	8872	7985
1884	7194	6475
1885	6654	5989
1886	10,391	9352
1887	27,633	24,870
1888	41,577	37,420
1889	36,700	33,030
1890	50,519	45,467
1891	43,256	38,930
1892	36,008	32,407
1893	34,693	27,754
1894	30,499	24,399
1895	32,698	26,159
1896	41,904	33,523
1897	42,196	33,757
1898, for the first half-year	23,378	18,702

No. 4.

COMPARATIVE Statement of Tin exported from Tasmania during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, *and for the first Half-year of* 1898, *compiled from Customs Returns only.*

YEAR.	TONS.	VALUE.
		£
1880	3954	341,736
1881	4124	375,775
1882	3670	361,046
1883	4122	376,446
1884	3707	301,423
1885	4242	357,587
1886	3776	363,364
1887	3607½	409,853
1888	3775¼	426,321
1889	3764	344,941
1890	3209¼	296,368
1891	3235	291,715
1892	3174	290,083
1893	3128½	260,219
1894	2934	198,298
1895	2726¾	167,461
1896	2700	159,036
1897	2423½	149,994
1898, for the first half-year	926¾	59,462

No. 5.

QUANTITY and Value of Silver Ore exported from Tasmania during the Years 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, *and the first Half-year of* 1898.

YEAR.	QUANTITY.	VALUE.
	tons	£
1888	417	5838
1889	415	7044
1890	2053	26,487
1891	4810	52,284
1892	9326	45,502
1893	14,302	198,610
1894	21,064	293,043
1895	17,980	175,957
1896	21,167	229,660
1897	18,364	200,167
1898, for the first half-year	6998¾	85,734

No. 6.

QUANTITY and Value of Blister Copper exported from Tasmania during the Years 1896, 1897, *and the first Half-year of* 1898.

YEAR.	QUANTITY.	VALUE.
	tons	£
1896	41½	1245
1897	4700	322,500
1898, for the first half-year	2234½	156,415

No. 7.

QUANTITY and Value of Copper Ore exported from Tasmania during the Years 1896, 1897, *and the first Half-year of* 1898.

YEAR.	QUANTITY.	VALUE.
	tons	£
1896	34	1020
1897	75	2250
1898, for the first half-year	51	1530

No. 8.

RETURN showing the Number of Persons engaged in Mining during the Years 1880 *to* 1897, *inclusive, and first Half-year of* 1898.

YEAR.	NUMBER.	YEAR.	NUMBER.
1880	1653	1890	2868
1881	3156	1891	3219
1882	4098	1892	3295
1883	3818	1893	3403
1884	2972	1894	3433
1885	2783	1895	4062
1886	2681	1896	4350
1887	3361	1897	4510
1888	2989	1898, for the first half-year	6223
1889	3141		

No. 9.

RETURN showing the Number and Area of Leases held under "The Mining Act, 1893," *in force on 30th June of each year since* 1892.

Nature.	In force on 30th June, 1892.		In force on 30th June, 1893.		In force on 30th June, 1894.		In force on 30th June, 1895.		In force on 30th June, 1896.		In force on 30th June, 1897.		In force on 30th June, 1898.	
	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.	NO.	AREA.
		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.
For tin, &c. at a rental of 5*s.* an acre	1857	89,962	1547	71,279	997	45,532½	720	31,207	738	33,077	1150	56,493	1290	66,981
For coal and slate, at 2*s.* 6*d.* an acre rent	47	6874	57	8963	23	4231	37	6551	37	5946	38	6105	41	5943
For gold, at a rental of 20*s.* an acre	489	4606	501	4801	374	3532½	455	4366	602	5712½	615	5789	702	7190
Water Rights, Mineral and Gold, at 20*s.* per sluice-head	173	812 sluice-heads.	135	890 sluice-heads.	198	866 sluice-heads.	176	755 sluice-heads.	160	808 sluice-heads.	155	774 sluice-heads.	159	784

No. 10.

RETURN of the Number and Area of Leases under "The Mining Act, 1893," *in force on the 1st July,* 1897, *issued during the Year ending 30th June,* 1898, *cancelled during the Year ending 30th June,* 1898, *and remaining in force on 30th June,* 1898.

Nature of Lease.	In force on 30th June, 1897.		Issued during Year ending 30th June, 1898.		Cancelled during Year ending 30th June, 1898.		In force on 30th June, 1898.	
	No.	Area.	No.	Area.	No.	Area.	No	Area.
		Acres.		Acres.		Acres.		Acres.
For Tin, &c., at a rental of 5*s.* an acre	1150	56,493	482	27,184	342	16,696	1290	66,981
For Coal and Slate, at a rental of 2*s.* 6*d.* an acre	38	6105	9	841	6	1003	41	5943
For Gold, at a rental of 20*s.* an acre	615	5789	329	3654	242	2253	702	7190
Water Rights, Mineral and Gold, at 20*s.* per sluice-head	155	774 sluice-heads.	27	102 sluice-heads.	23	92 sluice-heads.	159	784 sluice-heads.

MINING Companies registered during the Year ending 30th June, 1898.

NUMBER OF COMPANIES.	CAPITAL.
109	£326,135

TOTAL Area of Land applied for during the Year ending 30th June, 1898.

MINERAL.	NO. OF APPLICATIONS.	AREA.
		Acres.
Gold	351	3437
Silver and other Minerals	1589	103,404
Tin	46	1387
Coal, Limestone, &c.	20	1961
TOTAL	2006	110,189

In addition to the above, applications for 81 Water Rights for 512 sluice-heads of water were received.

TOTAL Amount of Rents, Fees, &c. received by the Mines Department during the Year ending 30th June, 1898.

HEAD OF REVENUE.	AMOUNT.
	£ s. d.
Rent under "The Mining Act, 1893," for Gold	5731 7 2
Fees " " "	689 10 2
Rent " " for Minerals	25,007 6 9
Fees " " "	3648 15 3
Survey Fees	16,489 7 4
Rent of Diamond Drills	5 6 9
TOTAL	£51,571 13 5

irregular seams of iron and copper pyrites are seen. To get some idea of the value of the pyrites, I took chippings from the more solid ore, which Mr. Ward, the Government Analyst, has assayed, with the following result:—Copper, 2·3 per cent.; gold, a trace; and silver, 9 dwts. 19 grs. per ton. No. 4 lode has been cut in several trenches to the south west of the main workings close to the Pieman. It is a well defined vein about 1 foot wide, striking about N. 15° W., consisting chiefly of iron pyrites, and is worth further prospecting.

The site for the bridge across the Pieman, on the Burnie-Zeehan Railway, is close to this spot, and between here and Rosebery several deep cuttings will be necessary, which will be an excellent prospecting work.

Work is also being carried on by the Cutty Sark Prospecting Association on the Boco Creek sections. For crossing the river, a cage working on a wire rope has been erected close to the main camp. The river here runs in a deep gorge, and during heavy floods rises 40 to 50 feet above its normal level, but at the time of my visit it was very low, and I was able to cross on a log about three-quarters of a mile above the cage, a little below the junction of Boco Creek and the Pieman. On Section 1776-93M a tunnel has been started from the creek and driven a few feet in a S.S.E. direction, showing several small veins and strings of iron and copper pyrites with a little chalcocite (black sulphide of copper) and native copper, and there is a good deal of pyrites disseminated through the country. A little lower down the creek a small vein of carbonate of iron carrying a little pyrites and galena is seen, running almost parallel to the tunnel. Nothing payable has so far been discovered, but the indications for the occurrence of a true lode are more encouraging, and when the tunnel gets further in under the hill a crosscut should be driven E. and W. The survey of the Burnie-Zeehan Railway follows the valley of Boco Creek for three or four miles, and several sections have been pegged further north along the line, but as I could not hear of any work being done on any of these I did not visit them. No work was going on on Sections 1830-93M and 1838-93M belonging to the North Cutty Sark Mining Company, or on Sections 1839-93M and 1840-93M, held by the Cutty Sark Consols Mining Company; but several prospecting trenches have been cut on the south side of the river showing pyrites disseminated irregularly through the country. One of these cuts, after passing through about 20 feet of rock, comes into alluvial ground, which has not been bottomed. It consists of river sand, and all along the banks the remains of old river terraces are seen, which are likely to contain a little gold.

Section 1841–93M.—To the south west of the Cutty Sark main workings a little trenching has been done on this section, which is held by the Robbie Burns Mining Company, but work has been abandoned for the present. In one trench a small vein was cut running N.W. and S.E. carrying galena, zinc blende, and pyrites, but not in payable quantities. Further south the country changes to slate, and a deep trench has been cut across the top of a low ridge, through kindly-looking slate, but nothing of value was cut. The slate strikes about N. 20° W., dipping at high angles to the E., and is probably a continuation of the slate seen in parts of the Rosebery District, on the eastern side of the schist belt, and prospecting is to be recommended further west.

Hawkesbury Mine, Sections 1700–93M and 1701–93M, 80 acres each.—These sections lie to the south of the Cutty Sark Mine, and the same belt of pyritiferous rock has been traced through them. A good deal of surface trenching has been done on the west side of the ridge which runs through the centre of the sections from north to south, and, wherever shot into, the country rock shows pyrites disseminated through it with occasional bunches and splashes carrying a good deal of copper pyrites, but no defined ore bodies. Near the boundary between the two sections a shaft was sunk 54 feet (now full of water), and a cross-cut driven about 40 feet to the east, but so far as I could see from the stuff at the surface nothing of value was cut, and the shaft has been abandoned. Further south, on Section 1207–93M, a deep trench is seen close to the track, about a chain in length, showing a little pyrites irregularly disseminated through the country. This section is held by the Ladas Mining Company, which also holds Sections 1206–93M and 1208–93M, but no work was being carried on so far as I know at the time of my visit, and I did not hear of any other prospecting work having been done.

It will be seen that all the mines in the Cutty Sark Group present very similar features. There is an extensive belt of country through which metallic sulphides, chiefly iron pyrites, with a little copper pyrites and galena, are disseminated. The formations resemble "stockworks" rather than true lodes, and, although in several instances the indications are sufficient to encourage further prospecting, it seems extremely doubtful if any permanent ore bodies of a payable character will be discovered.

Kershaw and Sandison's.—About 2 miles north of the southern section of the Cutty Sark P.A. a large deposit of iron pyrites has been discovered, locally known as Kershaw and Sandison's Big Show, and several sections have been applied for, which were not surveyed at the time of my visit. The formation outcrops near the top of a ridge, running approximately N.E. and S.W. about 1450 feet above sea level, the rise in the last mile of the track being 850 feet. 100 feet below the top of the ridge a shallow trench about 2 chains long has been cut, running about N. and S. The country rock is a siliceous schist, which is more or less impregnated with pyrites for the entire length of the trench, and towards the north end the pyrites become more solid, and contain a good deal of barytes. A little further north a tunnel has been driven about 20 feet through fairly solid pyrites

mixed with a good deal of quartz, and another small cut has been made into the solid pyrites about 150 feet lower down. As yet not enough work has been done to define either the approximate size or the strike of the ore body, but it is evidently a very large one, and large quantities of ore could be easily won by open cuts with very little stripping. As far as can be seen at present, however, the ore is far too poor to be payable, a sample which I took as fairly representing the ore in sight yielding, on assay by Mr. Ward, traces only of gold and copper and 19 dwts. 14 grs. silver per ton. Much better assays are, however, reported to have been obtained, and the formation is well worth further testing, which can be very easily done by tunnelling. At present it is impossible to do this economically, owing to the great cost of getting in supplies, and it is not likely that very much work will be done until the railway is completed.

Between Kershaw and Sandison's and the Pieman the country is mostly heavily timbered with a thick undergrowth, making it difficult to see the country rock, but in one place the track passes round cliffs of porphyritic felsite. This rock, as far as seen, is not mineral-bearing, but is likely to have had an important influence on the adjacent schists.

ROSEBERY DISTRICT.

To the west of Mount Black is an extensive belt of light-coloured argillaceous schists, in which there are several mineralised zones comparable with the Fahlbands of Norway. In these zones the schists are impregnated with sulphides of iron, zinc, lead, and copper for a considerable width, and on the Tasmanian Copper Mine and adjacent sections solid bodies of dense sulphide ore have been discovered. The schists have a general strike of about N. 20° W., dipping at varying angles to the E.N.E. In the eastern portion of the above-mentioned sections they gradually merge into black slates, and there can be little doubt but that the laminations of the schists correspond with original bedding-planes. The ore bodies are on the whole conformable with the schists, and may be classed as bedded veins. The ore has probably been introduced in aqueous solutions circulating along planes of weakness, the more or less shattered schist being dissolved and replaced by metallic sulphides. In other parts of the field lodes of the true fissure type have been found. The principal difference between these two classes of deposits is, that "a true lode" pre-supposes the existence of a fissure (generally crossing the strata) in which the ore has been deposited, whereas a "bedded-vein" is parallel with the enclosing strata, and the pre-existence of a fissure is not absolutely necessary, although it is probable that, as in the case under consideration, open spaces have been formed by the foliation of the schists, and subsequently filled with ore. It is now generally admitted that in many true lodes metasomatic replacement of the wall-rock has taken place to a greater or lesser extent, so that it is often hard to discriminate between the two classes, and in the following description of the work done on the different sections the "ore-body" will generally be referred to as the "lode."

Tasmanian Copper Mine (formerly called the Rosebery Mine).—The Tasmanian Copper Company, Limited, holds Sections 59-93, 60-93, and 61-93, 25 acres in all, under lease for gold, and Sections 95-93M, 206-93M, 207-93M, 208-93M, 254-93M, 258-93M, 277-93M, 339-93M, and 1205-93M, aggregating 434 acres, held under mineral lease, and a considerable amount of work has been done in opening up a large deposit of sulphide ore which runs in a N.N.Westerly direction through Sections 60-93 and 59-93, underlaying to the E.N.E. About 4 chains from the northern boundary and 5 chains from the eastern boundary of Section 60-93 is the mouth of what is known as No. 4 tunnel, which has been driven about 450 feet, more or less, along the course of the lode. The tunnel starts on a course of N. 34° W., and after passing through 30 feet of alluvial wash containing large water-worn boulders, comes into friable sulphide ore and gossan, some of which is said to have yielded very high assays for silver. These give way to dense sulphide ore, consisting of an intimate mixture of varying proportions of iron and copper pyrites, zinc blende and galena, and the drive is continued obliquely across the lode to the west or footwall, which is struck at about 100 feet from the entrance. The drive is then continued in a northerly direction through the lode, gradually making over towards the hanging-wall. At 120 feet from the entrance cross-cuts have been driven a little north of east and south of west 53 feet and 13 feet respectively. In the east end the hanging-wall is very well defined, showing the ore-body to be conformable with the schists, which here strike N. 20° W., and dip at an angle of about 40° N. 20° E. For a width of 60 feet measured along the cross-cuts it is nearly all solid sulphide ore, presenting a laminated appearance, with one or two small bands of mineralised schist. 150 feet further in, a cross-cut has been put in on either side of the drive across the lode, which here contains about 25 feet of solid ore. The drive continues all in ore for about 60 feet, when the footwall is again struck and followed for about 40 feet, the lode being here rather broken. At 120 feet past No. 2 cross-cut a cross-cut has been driven 48 feet S.W. to connect with an air-shaft 96 feet deep, which was started on the hanging-wall side and sunk through the lode into footwall country. This cross-cut is chiefly in schist, some of which is heavily impregnated with pyrites. Beyond this the lode seems a good deal disturbed and broken, with occasional bunches of quartz and copper pyrites, and it is probable that it has been shattered by a fault.

No. 2 tunnel is about 170 feet below No. 4. It starts in Section 277-93M on the footwall side of the lode, and was driven as a cross-cut bearing N. 35° E., passing within a few feet of the N.W. corner of Section 62-93 belonging to the Primrose Company. A little pyrites is seen in places disseminated through the schist, but the solid ore was first struck at 618 feet from the entrance, and

a cross-cut put in at this point a little north of east to the hanging-wall shows about 30 feet of dense sulphide ore. The main tunnel is continued obliquely across the lode, and at 646 feet a drive has been put into the north following the hanging-wall for about 95 feet. A drive has also been put in about the same distance to the south from the main tunnel along the footwall. The ore seen in the cross-cut and drives at this level is very similar in appearance, so that in the upper tunnel, the mouth of which is about 250 feet measured horizontally from where the lode was struck in No. 2, and from surface indications there is reason to expect that the ore-body will be found continuous between these points. It is proposed to drive another adit (No. 3) intermediate between No. 4 and No. 2, and eventually a fourth adit will probably be put in about 100 feet below No. 2, but this will have to be driven a long distance before reaching the ore. It will, however, prospect the footwall country, and it is quite probable that other parallel deposits will be discovered. A good deal more work will have to be done by cross-cutting, sinking, and rising in the lode before any definite figures can be given as to the approximate amount of ore in sight above the present levels, but it is quite sufficient to warrant the erection of reduction works, provided it can be shown that the ore can be treated at a profit. The management could not allow me to take samples from the mine with a view to publishing the results, so that I can give no idea of the value of the ore. In the Report on the progress of the work at the mine during 1897 made by the engineer in charge it is stated that there are 10,000 tons of ore at grass, and the average of over 2000 determinations made during the year is given as follows:—

	£	s.	d.
Gold, 0·15 oz. per ton, valued at.....	0	13	0
Silver, 12·85 ozs. per ton, valued at	1	6	0
Copper, 2·34 ozs. per cent., valued at	1	1	0
Total value of the ore per ton.....	£3	0	0

No mention is made of the zinc or lead contents, which are likely to have an important bearing on the degree of success attending the treatment of the ore, the presence of zinc blende in large quantities being decidedly detrimental in smelting. The ore for the most part is very free from gangue, but in places there is a good deal of quartz and sometimes barytes, and it is noticeable that where the quartz occurs it is generally accompanied by bunches of clean copper pyrites. At times the various sulphides occur in layers which would admit of handpicking, but, as far as could be seen, in the great bulk of the ore they are too intimately mixed for this, and any attempt to separate them by wet concentration would be attended by very imperfect results, and probably great loss in silver and gold, besides leaving the ore in a finely divided state unsuited for direct smelting.

An excellent site has been chosen and the ground cleared for reduction works, which it is proposed to erect as soon as railway communication is established. The ground has also been cleared for a self-acting tramway about 1600 feet long, which will deliver the ore direct from No. 2 tunnel to the smelters, so that there will be very little expense for handling. On the Stitt River a water-right of 40 sluice-heads (representing approximately 6000 gallons per minute) has been secured, and a race is now in course of construction to bring this in; the total length of this race will be about 5½ miles, of which about half is completed. On the Pieman 100 sluice-heads have been secured, and a survey is now being made for a race which will be about 15 miles in length.

It is probable that the ore will be treated by a modified form of "pyritic smelting," a process which is yet in its infancy and is becoming more widely used every year. The great advantages of this process are that it avoids the expensive and tedious operation of roasting, and effects a great saving of coke in the blast furnace, the rapid oxidation under the influence of a hot blast of the sulphur, arsenic, antimony, &c. present in a suitable ore furnishing sufficient heat to smelt the charge. Zinc blende in large proportions is very detrimental in this as in other methods of smelting: it carries silver and gold into the slag, which it makes pasty, requiring a large proportion of flux; it also causes great loss of silver and gold through volatilization, and forms infusible accretions in the furnace, thus shortening the campaigns and thereby increasing the costs of smelting. The limit of zinc which can be successfully treated in the blast furnace is from 8 to 12 per cent. of the charge, and it will be necessary to reduce the zinc down to these or lower limits by the "drowning process," *i.e.*, by mixing with other ores free from zinc. This will at once create a demand for clean copper ores, and many of the surrounding mines whose ore is too poor to export may thus be worked at a profit.

Primrose Mine, Section 62-93, 10 acres, and Section 290-93M, 16 acres.—On Section 62-93, formerly known as the South Rosebery, the continuation of the Tasmanian Copper Company's lode was cut in a deep trench about 160 feet from the northern boundary of the section, showing dense sulphide ore for about 15 feet across. On the hanging-wall side of the lode a vertical shaft has been sunk 40 feet, and connected with the adit level. In the shaft the solid ore was struck about 15 feet from the surface, and continued to within a few feet of the bottom, when it passed out to the east. At this point a cross-cut has been put in six or seven feet to the west in footwall schist impregnated with pyrites. In the tunnel a little ore was cut at about 50 feet from the entrance, and for a width of about 30 feet the schists are strongly impregnated with pyrites. At 65 feet a drive was started in a northerly direction going obliquely across the formation, the hanging-wall of which is touched about 60 feet from the tunnel, and followed in a N.N.W. direction. For the first 80 feet

from the tunnel the drive is chiefly in mineralised schist with small bands of solid ore, after which it continues nearly all in ore for about 170 feet. At 150 feet from the tunnel a cross-cut was put in to the west to connect with the shaft, showing about 10 feet solid ore measured perpendicular to the walls. 90 feet further a second cross-cut has been put in to the footwall showing about the same thickness of ore. About 20 feet beyond this, alluvial wash is seen in the back of the drive, and beyond this the formation is very broken, the last part of the drive, which was continued to within 12 feet of the boundary, having collapsed. I took a sample by chipping from all parts of the drive between No. 2 cross-cut and the shaft, which assayed as follows:—Gold, traces; silver, 17 ozs. 3 dwts. per ton; copper, 0·4 per cent.; lead, 14·6 per cent.; and zinc, 28·9 per cent. A second sample taken from the solid ore south of the shaft to the tunnel yielded—gold, 3 dwts. 6 grains; silver, 12 ozs. 5 dwts. per ton; copper, 0·4 per cent.; lead, 14·4 per cent.; and zinc, 27 6 per cent. These and all other samples which I took were assayed by Mr. Ward, the Government Analyst.

According to these assays the ore would seem too poor to smelt with such a high percentage of zinc, but it is only fair to add that much higher assays have been obtained, and it is manifestly impossible to obtain an accurate sample of the ore in sight without spending much more time than I was able to give to it. In any case this level is too shallow to be of much use for working purposes, and it would be advisable to put in a tunnel at a lower level from the Mount Black Prospecting Association's ground.

About 170 feet south of the tunnel a vertical shaft was being sunk in hanging-wall country, and at the time of my visit was down about 50 feet. The schist in the bottom contained a good deal of barytes, and is in places heavily charged with pyrites, with small seams of galena and blende. Since my return it has been reported that the lode has been passed through, 9 feet wide, in a cross-cut, which was driven to the west at 62 feet from the surface.

North Tasmanian Copper Mine, Section 191-93M, 40 acres.—In the northern part of this section, which lies to the north of Section 206-93M of the Tasmanian Copper Company, a trench has been cut from the eastern boundary for about 12 chains in length, running a little S. of W. across the country. Near the western end of the trench the country is a decomposed whitish schist, a good deal broken, in which small veins of blende and galena occur, striking about N.W. and S.E., but so far as could be seen are of no value. Going east along the trench the country gradually changes to black slate, and for a width of about 30 feet, near the east end, it is impregnated with pyrites. This belt is seen again in the bed of a small creek further north, and is probably a continuation of the Tasmanian Copper Company's formation, though it here contains no solid ore at the surface. As, however, the ore is likely to occur in lenticular masses, cutting out both horizontally and vertically, but making again at greater depths, it is quite possible that solid ore will be found below. Several chains south of the trench dense sulphide ore, similar in appearance to that found in the Tasmanian Copper and Primrose Mines, was cut, but its full width is not exposed. A little to the north of this cut a vertical shaft is being sunk, which, at the time of my visit, was about 75 feet deep. This shaft is closely timbered most of the way down, but the lode is said to have been struck at 56 feet, and in the bottom it is about 4 feet wide, underlaying slightly to the east. The ore here consists chiefly of fine-grained blende and pyrites, with a little galena, and is of low grade, a sample which I took from the bottom assaying—gold, traces; silver, 5 ozs. 4 dwts. 12 grs.; Copper, *nil;* lead, 4·6 per cent.; zinc, not determined. The top of this shaft is 1210 feet above sea-level, or nearly 400 feet above the Tasmanian Copper Company's lower tunnel, and so far it has been perfectly dry.

Rosebery Proprietary, Section 104-93M, 78 acres.—On this section, which lies E. and adjoining the North Tasmanian Copper Mine, prospecting was being carried on in a tunnel started by the old Rosebery Company, on Section 206-93M, the first 193 feet being in the latter section. At about 80 feet from the entrance a belt of schist, impregnated with pyrites for a width of 17 feet, was passed through, and a short drive put in to the south without meeting any solid ore. The schist is succeeded by a belt of black slate, having the normal strike of N. 20° W., followed by a band of grit 10 feet wide. Slate again comes in, and continues to within about 35 feet of the end, which is 256 feet from the entrance. The last 35 feet are through a decomposed felsitic rock, which does not seem very likely to carry minerals, and I should not advise any more work being done at this point. A good deal of trenching has been done on other parts of this property, which is very densely wooded and difficult to prospect; but, so far, nothing of importance has been discovered, and the indications are not very encouraging.

Mount Black Mine.—The Mount Black Prospecting Association holds Section 58-93M, 40 acres, and Section 59-93M, 20 acres. About five chains from the western boundary and six chains from the southern boundary of the latter section a lode formation about 6 feet wide is exposed in an open cut. For several feet on either side there is a deposit of brown oxide of iron formed by water issuing from the lode, but the oxidation does not continue for any great depth. About a chain further north the lode has been cut again, and shows 6 to 8 feet wide, striking N. 10° W., and underlaying about 50° to the E. On the footwall is a band of siliceous tourmaline rock, then about 18 inches of iron and copper pyrites, with tourmaline and quartz: towards the hanging-wall fluor spar predominates, with quartz and pyrites, and in some places a good deal of sulphide of bismuth and wolfram. This formation is evidently of different

geological age to that of the Tasmanian Copper Mine. It has every appearance of being a true fissure lode, and from the association of minerals that it contains it is quite probable that it will carry tin ore at a depth. An underlay shaft was sunk about 18 feet on the lode, but has been stopped pending the sinking of a main engine-shaft further to the east, and at the time of my visit was partly full of water. I took a rough sample from different parts of the shaft down to the water level, which gave an assay of 6 dwts. 12 grs. gold, 9 dwts. 19 grs. silver per ton, and 1·1 per cent. copper; but Mr. T. Dunn, the manager, informed me that a bulk sample of 1½ tons from the underlay shaft had been sent away, and gave a return of 1 oz. 3 dwts. gold per ton, no returns being made for silver or copper. The presence of bismuth is not desirable in copper-smelting, but the richest of the bismuth ore would probably pay to pick out by hand, and the balance would make an excellent flux for some of the more refractory ores of the district, and is, as far as I saw, quite free from zinc. To the north the lode has been cut in several trenches, but on the east is deep alluvial wash, which appears to be going down on the hanging-wall, and has not been bottomed. East of the alluvial flat, 190 feet from the underlay shaft, a main shaft has been started which it is anticipated will strike the lode at about 220 feet. This mine has the credit of being the first one in this district to be equipped with winding and pumping machinery, and, as everything has to be sledged or packed from Ringville, this has been a matter of considerable expense and some difficulty. The pump is worked from a water-wheel on the Stitt River by means of a wire rope 950 feet long. The pump was started while I was there, and worked very smoothly; the accumulated water in the shaft, which was then about 40 feet deep, was taken out in about four hours, and the incoming water was easily kept under with the slowest speed of the wheel and the shortest stroke. It is very probable, however, that a large body of water will be cut when the lode is struck. Two other parallel lodes have been cut on this section lying on either side of the main lode, containing a great deal of tourmaline in fine needles through a siliceous matrix with a little pyrites, but sufficient work has not been done to prove their value. A tunnel was also driven by the Mount Black Company from a point about two chains S. of the N. boundary of Section 88-93M, and the main lode was cut close to the boundary between the two sections. Near the centre of the southern boundary of Section 58-93M there is large outcrop of manganese gossan containing a good deal of barytes, but nothing has been done to prove what lies below it. It seems probable that the Primrose and Mount Black lodes junction somewhere about this point, and further prospecting is strongly to be recommended, but as the ground is rather flat this will have to be done by sinking.

Mt. Black Extended, Section 88-93M, 20 acres.—In the southern part of this section what is probably the continuation of the Mount Black main lode has been cut in several surface trenches, but towards the Stitt River it is covered with alluvial wash, which has not been bottomed on account of water. Just inside the northern boundary of the section a small prospecting shaft is being sunk, which it is intended to sink 50 feet, and then cross-cut west for the Mount Black lode, but it would be probably cheaper to prospect this from the tunnel previously mentioned which was put in by the Mt. Black Co.

On Section 220–93M, 80 acres, belonging to the South Tasmania Copper Mining Co., No Liability, a well defined lode formation about 3 feet wide, striking nearly N. and S. and underlaying to the E., has been cut in several trenches close to the *Rosebery Hotel*. The lode-matter consists of quartz and tourmaline, iron pyrites, and a little copper pyrites. As far as seen it is not of much value, but it deserves further prospecting. A tunnel is now being driven in a northerly direction along a lode formation seen in the bed of the Stitt River a few chains above the bridge. In the tunnel the lode is about one foot wide, underlaying considerably to the E., consisting of black siliceous material, with occasional splashes of iron and copper pyrites, carbonate of iron, &c. On the footwall is a thick seam of pug. This tunnel is in about 155 feet, and is about 60 feet lower than the above-mentioned trenches. I do not think that it is on the same lode as seen in the trenches, and it would be advisable after driving a little further to cross-cut E. and W.

The Great South Rosebery Mining Co., No Liability, hold Sections 1064–93M, 1065–93M, 1066-93M, 1067–93M, and 1068–93M, a total of 279 acres, an area far too large to thoroughly prospect with a small capital. On Section 1065-93M several small lodes a few inches in width are seen, carrying iron and copper pyrites, &c., striking a little W. of N. and standing almost vertical, but they are mostly too small to offer much encouragement for opening up. On what is known as No. 1 lode a tunnel has been driven 35 feet bearing N. 35° W. The lode is about 9 inches wide, and carries iron and copper pyrites, with quartz, tourmaline, and a little fluor spar. This lode can be traced on the surface for several chains further north, and contains in places good bunches of ore, picked samples of which are said to have assayed nearly 2 ozs. of gold. Though small, it is worth further prospecting. Further south an outcrop is seen forming a bar across the Stitt River. Its strike is about N. 5° W., and for a width of about 20 feet there is a little iron and copper pyrites disseminated through the country, which is a silicified schist. A short distance north of the river a shaft was started on the east, or hanging-wall side of the formation, but owing to bad standing-ground, water, and lack of funds, was discontinued before striking any ore, and has since collapsed. A tunnel has now been started to cross-cut to the footwall, but is too shallow to be of much practical use.

South Mt. Black.—South of the Stitt River, on Section 281-93M, 57 acres, belonging to the South Mt. Black P. A., several lode formations have been cut, but no work was going on at the time of my visit. The principal work done is an open cut in a southerly direction on a lode about four feet wide, with well defined walls striking about N. 10° W., and underlaying 1 in 2 to the E, The lode filling consists of quartz impregnated with tourmaline, with a little iron and copper pyrites through it, and in places fluor spar. It is probable that this is a continuation of the Mount Black lode, and will doubtless receive further attention should the latter company get good ore at a depth. Two or three chains further west a similar lode has been cut striking, apparently, a little E. of N., and it has been traced by surface trenches for 5 or 6 chains to the north, but approaching the Stitt River it is covered with deep alluvial wash. These lodes have every appearance of being true fissure lodes, the central druse being filled with interlacing quartz crystals perpendicular to the walls.

Byron.—Going S.E. into Section 362-93M, 40 acres, held by the Byron Mining Company, No Liability, numerous threads and small veins are seen running through the country consisting chiefly of quartz and tourmaline, with sometimes a little pyrites. About three chains from the northern and five chains from the western boundary a trench has been cut to the S.S.E. on a small vein containing tourmaline, fluor-spar, and quartz with copper and iron pyrites. This vein strikes about N. 20° W. underlying slightly to the east, and has been cut again about a chain and a half from the southern boundary. The Stitt River runs through the S.E. corner of the section, and from the river level a long trench has been cut in a general westerly direction. This goes through a belt of pyritiferous schist, which is probably a continuation of the sulphide body seen on the other side of the river in Section 141-93M. In the end of the trench black slate is seen, and a small lode formation was cut underlaying to the W., carrying a little pyrites, but nothing of value. Close to the southern boundary and about 12 chains from the western boundary an open cut has been put in about 10 feet to the N. on a lode about two feet wide, chiefly quartz and tourmaline, with a little copper and iron pyrites. The country is very hard, the schist being silicified, probably by the same solutions that deposited the quartz in the lodes. In the eastern part of the section an intrusion of felsite rock is seen, which has probably had an influence on the filling of the lodes. It is possible that these may come together at a depth and form a large lode, but the country is too flat to prove much by means of tunnels, and the only way to prospect the ground would be to sink a shaft in a central position as deep as the water would allow, and then crosscut E. and W., but the water is likely to prove heavy.

Balstrup's Section, 141-93M, 80 acres.—The body of sulphide ore above alluded to was cut close to the river and extends into the river bed, so that its full width is not seen. The ore consists of an intimate admixture of quartz, iron pyrites, blende, and galena. It would be impossible to prospect this without sinking, but the ore is too poor to warrant this, a sample which I took assaying traces of gold and copper, 1 oz. 12 dwts. 16 grains silver per ton, and 6·6 per cent. lead. Further S.W. a prospecting shaft is being sunk on a strong manganese gossan outcrop containing in places a good deal of barytes. This has a very kindly appearance, but the unoxidised zone has not been reached, and not enough work has been done to show the strike or dip.

Berry Consols, Section 363-93M, 40 acres.—On this section six small lodes have been cut, all of which with the exception of No. 6, the most easterly one, strike E. of N. No. 1 lode, which was cut close to the river near the western boundary of the section, strikes about N. 10° E. underlaying slightly to the E. The country rock is a greenish schist, which is impregnated with pyrites for several feet on either side of the lode. A picked sample from here is said to have assayed 4 per cent. copper, 1 oz. 7 dwts. 18 grains gold, and 1 oz. 9 dwts. 9 grains silver per ton. No. 2 lode is seen further south crossing the Stitt River, but no work has been done on it. No. 3 is also seen in the bed of the river a little further E., and has been traced to the northern boundary of the section and into Section 1067-93M belonging to the Great South Rosebery Co.; a tunnel is now being driven on it going south into a small knob rising about 40 feet above the tunnel. The formation is well defined, about 15 inches wide, and shows some nice-looking gossan and copper pyrites. Mr. Sands, the manager, informed me that two samples of copper pyrites from here had assayed as follows:—No. 1 sample, 29·11 per cent. copper, 5 dwts. gold, and 13 ozs. 11 dwts. silver per ton; No. 2 sample, 16·01 per cent. copper, 6 dwts. gold, and 9 ozs. silver per ton. To the east of No. 3 lode is a button-grass flat, in which occasional large boulders of conglomerate are seen; this is probably an old bed of the Stitt River. No. 4 lode is seen in several trenches on a low spur to the east of this flat; it is a good deal broken, consisting of quartz and schist impregnated with pyrites and containing in places a good deal of tourmaline. No. 5 has a strike of N. 5° E.; it is about 9 inches wide, the outcrop showing gossan with iron and copper pyrites, but very little work has been done on it. No. 6 lies to the east of No. 5, and is about 18 inches wide, striking N. 20° W. and underlaying slightly to the E.N.E.; this has been traced for several chains, and a good deal of trenching has been done on it. Going north it branches into two veins, which will probably run together again. I took a sample by chipping from various places where this lode was exposed, which assayed—gold, a trace, silver, 2 ozs. 5 dwts. 17 grains per ton, and copper, 2·2 per cent. Other assays as high as 2 ozs. 2 dwts. gold, 2 ozs. 6 dwts. silver per ton, and 2·6 per cent. copper are said to have been obtained.

All the lodes on this property are small, and very little real mining work can be done without sinking, but the ore being, as far as could be seen, free from zinc, should find a ready sale when local smelters are erected.

New Koonya Mine, Section 413-93M, 80 acres.—This section is situated to the west of the valley of the Stitt River, on the eastern slope of a long spur running down from Mount Read, about 2½ miles south of Rosebery. It is nearly all open button-grass country, the only timber being in the gullies. Large detached masses of conglomerate are seen up to the top of the spur, evidently the remains of a former sheet which once covered all this district. It rests unconformably on a greenish argillaceous schist similar to that seen in the Tasmanian Copper Mine, and there is apparently another parallel mineralised zone. In the south-eastern part of the section, at an elevation of 1400 feet above sea level, a deep trench has been cut running a little S. of W., in which the schist for a width of about 30 feet is more or less heavily charged with iron pyrites. Towards the west end of the trench are two veins of solid glassy quartz underlaying to the W., whereas the schist dips about 45° to the E.; the country is a good deal broken with bunches of quartz through it, and one of the quartz veins has been slightly faulted. I took a sample of the schist from this trench which gave on assay traces only of gold and copper, and 9 dwts. 19 grains silver per ton. About 2 chains further west and some 80 feet above the trench is an outcrop of very kindly-looking gossan. To the east the ground falls rapidly, and a tunnel could be easily brought in to cut these formations at a considerable depth. To the N.W. of this outcrop, at an elevation of 1650 feet, a hole has been sunk a few feet on what is known as the Gossan Lode, striking about N. 25° E. and underlaying 1 in 1 to the E.S.E. Some of the gossan is said to have given good returns for gold, but a sample which I took across a width of five or six feet gave only traces of gold and 19 dwts. 14 grs. silver per ton. A tunnel is now being driven 80 feet below the outcrop to intersect this, and at the time of my visit was in about 190 feet. The country passed through is a decomposed felsitic rock, probably an igneous dyke, with occasional bands of quartz and a little pyrites, but so far no sign of any lode.

Grand Centre, Section 577-93M, 64 acres.—No work was going on on this section but some fairly solid copper pyrites with a little erubescite is seen at the mouth of a shaft a few chains from the southern boundary of the New Koonya. This shaft is now full of water, but I was informed that it was sunk 54 feet, and at 20 feet a lode was cut 4 feet wide. At 50 feet a cross-cut was put in to the E. and cut the lode 3 feet wide, about 9 feet from the shaft.

Chamberlain Mine, Sections 1908-93M, and 911-93M.—On the latter section, about a quarter of a mile to the E. of the pack-track between Rosebery and Ringville, a deep cutting has been made across a formation about 14 feet wide, consisting of laminated quartz with a little iron and copper pyrites throughout, the sides of the cut being stained with copper salts. The formation appears to be conformable with the enclosing siliceous schists, striking nearly N. and S., and underlaying at an angle of about 45° to the E.. This is well worth testing at a depth, and a tunnel could be brought in at a considerable depth from the west, the ground falling rapidly. Another parallel lode has been cut several chains further N., lying apparently a little E. of the other, and at the time of my visit a tunnel put in to cut this had just penetrated the lode, which shows very solid ore, containing a good percentage of copper pyrites. A sample which I took from the face assayed 16 dwts. 8 grs. gold, 6 ozs. 7 dwts. 9 grs. silver per ton, and 10·5 per cent. copper, zinc 0·5 per cent. The ore from this mine would be very suitable for mixing with the refractory zinciferous ores of the Tasmanian Copper Mine, and there would be very little difficulty in putting in a connecting tram to bring the ore to the smelter site.

The Chamberlain Mining Co. also holds Section 1908-93M, but, so far as I could hear, no work was being done on this Section.

Glenfine Mine, Sections 1613-93M, 56 acres, and 1614-93M, 80 acres.—The principal work done on this property is a prospecting shaft, which has been sunk 50 feet on a strong gossan formation. From the bottom a cross-cut has been put in W. 26 feet through gossan and iron-stained country, showing in places a little pyrites. In the end there is a great deal of carbonate of iron and carbonate of manganese, and it seems probable that the gossan has been formed from the decomposition of these rather than from sulphide ores. This, and all the adjacent sections, are very thickly wooded, with a dense undergrowth, which makes prospecting very difficult.

S. Glenfine, Section 1818-93M, 79 acres.—About 2 chains south of the centre of northern boundary of this Section an open cut has been made a little S. of W., passing under the old track from Ringville to Rosebery: for a width of about 20 feet the country is a good deal stained with oxide of iron, and several small veins of quartz and pyrites, striking about N. 14° W., are seen, but nothing of value. About 10 chains further W. another formation, known as the West Lode, has been cut in several trenches. In one of these trenches there is about 10 feet of good-looking gossan, and to the W. of this is a band of quartzose grit 5 or 6 feet thick, with pyrites disseminated through it. About 50 feet below this trench a tunnel has been driven about 60 feet, bearing N. 56° W., chiefly through decomposed slate; near the end several feet of gossan have been passed through, and the end of the tunnel is in black slate. The oxidised zone evidently continues for a

considerable depth, but is not likely to extend much below this level, and as it is not possible to bring in a lower tunnel at this point, it would be advisable to sink a winze from the present tunnel. In the eastern part of this section the country rock is schist, which, going W., gradually merges into slate. All this country is favourable for minerals, and, doubtless, fresh discoveries will be made as the bush is cleared.

Great North Colebrook, Section 553-93M, 40 acres.—The workings on this Section are situated close to the junction of the Pieman River and the Natone Creek. In the valley of the Natone above the junction there is a considerable depth of alluvial wash, from which a little gold was obtained some years ago. On the west side of the creek is a high cliff of siliceous ironstone, which outcrops for several chains in width. Just above the creek a tunnel has been driven in a S.W. direction about 90 feet through the ironstone: so far nothing of value has been discovered, but it is quite worth while sinking to test its value below water-level.

On the east side of the creek the ground rises very rapidly, and some trenching has been done on the slope of the hill, on what is known as the "New Find." About 80 feet above the creek a bench has been cut exposing a few feet of conglomerate containing copper pyrites scattered through it. To the east of this slate is seen dipping to the E. A little further N. a trench was being cut in a S.E. direction up the hill through slate country, and at the lower end of this is seen a good deal of copper pyrites and quartz looking more like ordinary lode-matter. On the top of the hill, 120 feet above the creek, is an outcrop of brecciated conglomerate also carrying a little copper pyrites.

A short tunnel from the level of the creek would test all this ground at a considerable depth.

Colebrook Mine, Sections 216-93M, 236-93M, and 239-93M, aggregating 208 acres.—On this property an immense body of ore has been discovered, consisting chiefly of magnetic pyrites, with iron, arsenical, and copper pyrites in a matrix composed of axinite, datholite, calcite, and fibrous hornblende, or actinolite. The ore body outcrops on the summit of a ridge which runs about N. and S. at a height of about 1700 feet above sea level, the N. and S. line forming the boundary between Sections 216-93M and 239-93M passing along the ridge. A deep trench, about 35 feet long, has been cut across the summit, and for about 20 feet at the E. end of this there is a good deal of magnetic and copper pyrites, with axinite and actinolite, but in the W. end it is mainly actinolite. The present camp is situated a little S.E. of this cut, in a gap in the ridge; and to the S.E. of the camp is another bold outcrop consisting chiefly of axinite with a little copper pyrites through it. About 60 feet N. of the summit a long trench has been cut down the western slope, following a very regular wall of indurated slate, which has been traced through to the eastern slope, forming as far as seen the limit of the ore body at this point. Two and a half chains S.W. of the summit an open cut has been made about 35 feet wide. On the western side the slate wall is seen striking about N.E. and S.W. Towards the eastern side a great deal of copper pyrites is showing for a width of about 10 feet, and a shaft was sunk 33 feet. Samples of the ore from this shaft are said to have assayed 7 per cent. copper, and over an ounce of silver per ton. 70 feet below this shaft a tunnel has been started which it is intended to drive through the hill to connect with a tunnel from the same level on the eastern side. This tunnel is in the solid ore body, which is here poor and very hard. On the eastern slope of the hill what is called "I. tunnel," 160 feet below the summit, has been driven 40 feet in a westerly direction, the first 30 feet being through oxidised lode-matter, and the last ten feet in solid sulphide ore. A drive has been put in 143 feet to the S., which for the greater part of the distance is between the oxidised and unoxidised portions, but the last few feet are in solid sulphide ore, chiefly pyrrhotite (magnetic pyrites). It is proposed to continue this drive to come under the axinite outcrop mentioned above.

K. Tunnel, about 100 feet further north, and 150 feet below the summit, starts from the slate wall seen on the western side of the ridge, and at the time of my visit had been driven about 55 feet in a south-westerly direction in very hard ore consisting of pyrrhotite, arsenopyrite, and a little chalcopyrite, with axinite and hornblende. It was intended to connect this tunnel with the tunnel on the western side, the distance through the hill along this line being 485 feet, but, as the ground is so hard, the advisability has lately been considered of putting in a horizontal bore with a diamond drill. This would be an excellent way of testing the ore body, and might be used with advantage in other parts of the deposit, but at present it is not possible to get any heavy machinery on to the mine without very great expense. Just below this tunnel the slate wall appears to turn to the N., and forms what is called the western wall of the ore body. Between 4 and 5 chains further N. is an open cut or bench about 85 feet long. In the western end of this cut indurated slate country is seen, which is a good deal broken, the boundary between the ore body and the country being very irregular. Near the wall a good percentage of copper pyrites is showing for a width of 3 or 4 feet, then about 40 feet, chiefly pyrrhotite with a little copper pyrites, axinite, &c., this is succeeded by a belt of more or less oxidised ore showing stains of copper sulphate, and then a bar of slate about 25 feet wide. Between this cut and the tunnel several trenches have been cut showing ore with bars of country, but going S. the ore becomes more solid. About 50 feet below the open cut a tunnel has been driven about 100 feet in a south-westerly direction, and cross-cuts put in to the N.W. and S.E., 27 feet and 44 feet respectively. The main tunnel is in the solid ore body, but the western crosscut has been driven to the slate wall, and in the eastern cross-cut the last 10 feet are in altered slate country, probably the bar seen in the open cut above. About 55 feet

below this tunnel is No. 2 open cut extending from the western wall for a distance of over 100 feet across the ore body. The ore is similar to that seen in the upper cut, containing a good deal of copper pyrites on the western side. 70 feet below this cut a tunnel has been driven about 70 feet in ore, containing very little copper. This tunnel is about 420 feet below the summit of the ridge, and below the ground falls rapidly to the east. To get anything like an accurate idea of the value of this deposit, it would be necessary to take a great many samples, and, as the ore is very hard, this would entail several days' work. Very large quantities of ore are now in sight, and could be very cheaply mined by open-cast workings, but as far as can be seen, and according to the published assays, it is too poor in copper and the precious metals to smelt by itself. It should, however, form a good ore to mix with the more refractory zinciferous ores of the Rosebery mines. Both the axinite and the datholite contain a good percentage of lime and are easily fusible, and the pyrrhotite, although containing a smaller percentage of sulphur than iron pyrites, is more suitable for fuel in pyritic smelting, as the latter parts with half its sulphur at a red heat, and this has a tendency to condense in the upper parts of the furnace and clog the ore together.

The extension of the Great Northern Railway from Rosebery to Zeehan will pass round the foot of the hill, and could be easily connected with the mine by a self-acting tram, so that the ore could be handled very cheaply.

This ore body is unlike any of the other large pyrites deposits in the Colony. It is apparently increasing in size as it goes down, but it has no regular shape, and its origin is a matter of speculation. The flinty appearance of the "wall" slate points to the presence of an igneous intrusion, and it seems probable that the ore body was originally a basic igneous rock, out of which the sulphides have segregated while the magma was still in a pasty condition, and that the boron compounds, axinite and datholite, were subsequently formed by pneumatolytic agencies (ascending vapours). According to this theory, we should expect to find the copper contents more concentrated on the outside of the deposit, a point which experience alone can settle. The presence of considerable quantities of arsenopyrite is somewhat difficult to explain by the principle of "Magmatic Differentiation," and it is quite possible that the presence of the sulphides is due to hydrothermal action. The so-called "intrusions" of country met with in the ore body are probably portions of the original country rock which have been caught up by the igneous mass and more or less altered.

New West Colebrook, Section 321-93M, 80 acres.—The ground falls rapidly to the west into this section from the outcrop on the Colebrook. Close to the eastern boundary several prospecting shafts have been sunk through angular débris, which is, in places, over 30 feet thick, containing fragments of axinite, &c., derived from the waste of the rocks above. The bed-rock appears to be a partly serpentinised gabbro, which is probably connected with the belt of serpentine seen further west. The country is favourable for the occurrence of mineral lodes, and a good deal of trenching has been done, but so far nothing of importance has been discovered.

Clifton, Section 237-93M, 67 acres.—An ore body has been discovered on this section containing the same association of minerals as is met with in the Colebrook property, which it adjoins on the south and east. About 700 feet below the outcrop on the Colebrook a bench has been cut along the western slope of the hill, and for a width of about 100 feet there is more or less oxidised ore with bands of decomposed slate, and in places a good deal of axinite with iron, copper, and magnetic pyrites; samples from this cut are said to have given good assays for gold and copper. 55 feet below the bench a tunnel has been driven about 85 feet, bearing S. 20° E. Near the entrance there is about 2 feet of gossan running north and south, and underlaying to the west. The country in the tunnel is chiefly altered slate, but for the last 20 feet there has been a good deal of axinite and pyrrhotite, with a little copper pyrites. This formation has probably been formed by a dyke from the main mass seen in the Colebrook, and though nothing payable has yet been discovered, the property is well worth further prospecting.

On the track between the Clifton and Colebrook, the belt of serpentine above alluded to is crossed; this passes through the New West Colebrook and is seen further S. in the Lynton and on the track between Ringville and Rosebery.

Lynton Mine, Section 282-93M, 80 acres.—The serpentine outcrops on this section in bold cliffs to the N.W., of which a good deal of trenching has been done on a large irregular outcrop of gossan. Several small veins up to 3 inches thick of solid galena have been cut, associated with calcite and barytes, but they seem to have no regular strike. A tunnel to cut this formation is now being driven through serpentine, but had not reached the ore at the time of my visit.

RINGVILLE DISTRICT.

The prevailing rocks of this district are slates and sandstones, passing into grits, breccias, and conglomerates. As far as can be seen, the latter are conformable with the slates, and belong to an older formation than the conglomerates seen capping the mountains further E. and S. In some of the cuttings on the N.E. Dundas Tramway tufaceous beds are seen, and it is probable that some of the breccias are also of volcanic origin.

These rocks are traversed by a number of more or less parallel lodes striking a few degrees W. of N., containing argentiferous antimonial fahl ore associated with jamesonite and other antimonial ores, galena, zinc blende, iron and copper pyrites, and occasionally a good deal of sulphide

of bismuth. The lodes are fairly persistent in their strike, and some of the ore is very rich in silver, picked samples of fahl ore having assayed nearly 3000 ozs. per ton, or more than nine per cent., but they are all very patchy, and so far the results obtained are distinctly disappointing.

Curtin-Davis Mine.—The most extensive workings are those of the Curtin-Davis Proprietary Co., which holds two 80-acre blocks, Sections 242-93M and 292-93M. The latter section originally belonged to the Curtin-Davis Extended Mining Co., with which the Curtin-Davis Mining Co. was amalgamated.

The configuration of the ground is exceptionally advantageous for economic mining, the rise from the northern boundary of Section 242 to the top of the hill on Section 292 being nearly 1450 feet, and for a great part of the distance the lode is seen outcropping on the steep face of the hill. The following is a brief summary of the work done on this property, the levels being named according the vertical distance below the summit of the hill:—

1430 *feet level.*—This is the lowest tunnel, starting close to the northern boundary of the property, and was driven 88 feet along the course of the lode, which here contained nothing of value.

1150 *feet level* was driven 123 feet across the line of the lode by a former company without cutting any ore.

1000 *feet level.*—This was driven 137 feet on the course of the lode. At the entrance, and for the first 30 or 40 feet, there is a small vein of gossan, samples from which are said to have given high assays for silver and up to 15 per cent. of bismuth, but for the last 100 feet the lode was much broken, and contained only iron pyrites of no value.

840 *feet level* was driven 265 feet on the course of the lode, which varied in width from a few inches up to two feet between slate walls. Some very high grade fahl ore was obtained in driving this tunnel, but it was very patchy. At 95 feet from the entrance a rise was put up 16 feet, starting on good ore, but at the top the lode only contains a little iron pyrites of low grade.

680 *feet level.*—The total length of this tunnel is 456 feet. Good ore was met with in bunches, and about 66 feet has been stoped for a height of 20 feet over the back of the drive. Going S. the lode was lost, and at 289 feet a cross-cut put in to the W. cut it again at 31 feet. From this point the lode was driven on S. 136 feet, averaging about two feet wide with well-defined walls, but containing chiefly carbonates of iron and manganese. Where the lode was cut in the cross-cut a rise was put up and connected with a winze from the next level, 120 feet above. To show the patchy nature of the ore above this level the following test was made by the manager, Mr. Luke Williams, to whom I am indebted for many of the figures given:—One stope 6 feet high and 6 feet long yielded 2½ tons of ore which assayed 11·6 per cent. copper and 177 ozs. silver per ton, and the next six feet produced about 2 tons, assaying 2·7 per cent. copper and 29 ozs. silver per ton.

560 *feet level* driven 370 feet. For 60 feet from the entrance the ore is more or less oxidised about 1 foot wide, with good bunches of copper pyrites and fahl ore. At 110 feet a winze was sunk to connect with the rise from the 680 feet level. Going down the winze the lode gradually widens, and at 35 feet below the level it is about three feet wide, chiefly carbonate of iron with a little copper pyrites. The underlay is very irregular, in places being very flat to the east, gradually becoming vertical, and above the 680 feet level turning slightly to the west At 157 feet from the entrance a rise was put up and connected with the winze from the 420 feet level. From this rise the lode has been stoped for a length of 40 feet N. to a height of 50 feet, and 67 feet S. to a height of 13 to 19 feet. Some high-grade ore was obtained, but it was very bunchy and erractic. From the end of the drive a cross-cut was driven 52 feet to the E., but no ore was cut.

420 *feet level*, 50 feet from the entrance, a little stoping was done, and about 6 tons of oxidised ore obtained, assaying 6·4 per cent. copper and 67 ozs. silver per ton. Going S. the drive got off the line of lode, and at 143 feet cross-cuts were driven 28 feet E. and 19 feet W. The lode was cut in the latter about 2 feet wide, carrying fahl ore and carbonate of iron, and good ore continued in the drive for over 100 feet. In the stopes above this level some good ore is seen, but the shoot seems to be going up in the form of a wedge, and at a height of 25 feet is only a few feet long. Further S. another shoot of good ore was cut 40 feet long, and a rise put up 37 feet on the lode, which varied from a foot to two feet in width. The shoot of ore was stoped N. and S. from the rise for a height of about 16 feet, at which height it is only about 26 feet long. The lode in the end of the drive, which has a total length of 465 feet, shows only strings of carbonate of iron in hard siliceous black slate. Outside this tunnel there is a pile of about 160 tons of gossan broken out by a former company, which is said to average about 30 ozs. silver per ton.

180 *feet level.*—This tunnel was driven as a cross-cut by the old Curtin-Davis Extended Company, and the lode was cut at about 100 feet, and followed S. for 143 feet. At 20 feet S. of the cross-cut a winze was sunk 90 feet. This was inaccessible owing to bad air, but Mr. Williams informed me that 75 feet down he had opened out and driven 27 feet N. and 13 feet S., the lode varying in width up to 2 feet, with good ore in bunches, but it had cut out in both ends. In the S. end of this level a rise was put up to the 100 feet level, the lode being poor. Between the 420 feet and the 180 feet levels a tunnel was driven about 80 feet on what is known as the East Branch, which is about 1 foot wide, gossan showing carbonate of lead.

100 *feet level.*—Total length, 255 feet. For the first 225 feet the ore was chiefly gossan, with occasional patches of fahl ore and copper pyrites, but for the last 30 feet there is a good deal of zinc blende with galena and carbonate of lead, also a little native copper. A good stack of gossan, estimated at 266 tons, assaying about 12 ozs. silver per ton, has been raised from this tunnel.

On the summit of the hill the lode has been cut in several trenches, and shows up to 4 feet wide of gossan.

In the eastern part of Section 242-93M, to the E. of the Montezuma Falls, a little driving has been done on the E. lode, which is supposed to be a continuation of the lode in Block 291, but nothing payable was discovered, and as no work was going on I did not visit these workings. This formation is seen in the railway cutting a little beyond the Montezuma bridge, containing chiefly iron pyrites.

Mr. Williams kindly supplied me with the following figures showing the amount of work done on the property:—Total length of drives on course of lode, 2375 feet; winzes, 304 feet; rises, 205 feet; ground stoped, 20,712 cubic feet, which produced 427 tons of ore, of an average assay value of 3·9 per cent. copper and 32·4 ozs. silver per ton. From these figures it will be seen that the mine has been energetically opened up, but I think it a great pity that more cross-cutting has not been done. At the end of the year a disastrous bush fire swept through the district, destroying all the mine buildings, plans, &c., and no underground work has since been done. It is now proposed to let the mine on tribute, and some of the blocks should yield a good profit. In the upper levels there is a good deal of gossan of rather low grade, but which should pay to work as soon as smelting-works are established at Zeehan. The North-East Dundas Tramway passes round the hill about 600 feet below the 680-feet level, and to convey the ore from this level to the trucks a self-acting ground-tram, 950 feet long, was constructed. The drum has two powerful brakes, and the load of about half ton which is sent down each time is easily controlled. The bagged ore which was being sent away amounted to about 200 tons, which, Mr. Williams informed me, averaged 8·2 per cent. copper and 70 ozs. silver per ton; and the cost of packing this to the railway would have been about 10*s.* per ton, amounting to more than the total cost of clearing, grading, constructing, and equipping the self-acting tram. This line is also utilised by the Curtin-Davis No. 1 Company for sending away their ore.

South-West Curtin-Davis Mine, Section 248-93M.—This section is situated to the W. of the Curtin-Davis Proprietary Company's Southern block. The lode was first discovered on the western slope of the hill, about 8 chains from the southern and eastern boundaries of the Section, and the gossan outcrop containing in places high-grade Fahl ore, was traced for several chains N. and S. Going N. the outcrop is almost level for some distance, so that the bearing of the outcrop practically agrees with the strike of the lode, which is about N. 14° E.; it underlays about 1 in 3 to the E., and the ground falls to the W., so that each successively lower cross-cut is considerably longer than the preceding.

In No. 1 adit, which is about 50 feet below the outcrop, the lode was cut at about 90 feet, and driven along N. 140 feet and S. 210 feet. In the south drive good ore was obtained for about 50 feet, and stoped to the surface. The level was then continued over 150 feet, during which the only ore met with was a patch about 15 feet from the end, containing a large proportion of sulphide of bismuth. In the north drive the lode was small and poor for the first 40 feet, when a shoot of ore about 40 feet long was met with, and this has been stoped out to the surface. Beyond this shoot the lode is poor, containing chiefly carbonate of iron. A winze was being sunk at the end of the cross-cut to connect with the No. 2 adit, which is directly under No. 1, and 96 feet lower. In this adit the lode was cut at 265 feet, and has been driven on about 60 feet N. and S. A little stoping has been done on both sides of the cross-cut on shoots of ore corresponding with those in No. 1 level, but apparently not quite so long. In the north drive a winze has been sunk a few feet on the shoot, and shows very good ore going down. As far as can been seen the shoots of ore go down almost vertically, the pay-ore in them varying in width from 1 inch to 16 inches. Both ends in this level are at present poor, and, judging by the level above, it is probable that a considerable length of blank ground will have to be driven through before meeting any more ore, but it is quite possible that other shoots will be cut which do not reach to the surface. About 3½ chains S. of No. 1 adit, and 78 feet above it, is another short tunnel known as the South Adit, in which the lode was cut at about 30 feet, and driven on a few feet south. From the end of the cross-cut a rise has been put up and connected with a prospecting shaft from the surface, in which some good ore was obtained, but it seems to be very patchy. S. of this the hill rises more rapidly, and as patches of ore are seen in the outcrop it would be advisable to push on the S. drive.

The country rock met with in the workings is chiefly an altered slate, but in places it is an intensely hard brecciated conglomerate, which makes driving very expensive. Altogether about 270 tons of ore have been sent away from this mine, the average assay of which was about 12 per cent. copper and 120 ozs. silver per ton. Most of it has been sent to the Dapto Smelting Works, New South Wales, where it finds a ready sale; but one trial parcel, which was sent to Swansea, England, was refused on account of the bismuth contents. The ore is delivered at the tramway siding by means of a self-acting wire ropeway 20 chains in length.

No work was going on at the South Curtin-Davis and Hecla Curtin-Davis Mines, and so I did not visit these properties.

Section 302-93M.—On this section, belonging to the Block 291 Silver and Copper Mining Co., a wide lode formation has been cut, running about N.W. and S.E., and underlaying to the N.E. For a width of about 20 feet the country, slate and sandstone, is impregnated with pyrites, and

here are several veins up to a foot in thickness of solid pyrites with small seams of galena, jamesonite, &c., associated with carbonate of iron. Several tons of galena and pyrites have been obtained from an open cut, the galena being said to assay up to 48 per cent. lead and 89 ozs. silver per ton. A tunnel was started to cut the lode at a considerable depth, but was discontinued after being driven about 230 feet through altered clay, slate, and sandstone. This formation seems worth further testing, and it is a pity that the tunnel was stopped before cutting the lode. The continuation of this is seen further S.E. in Section 291-93M, the outcrop showing gossan and pyrites with a little galena in a matrix of carbonate of iron. Seventy feet below the outcrop a tunnel was driven S.W. and cut the lode at about 80 feet; the lode was driven on a few feet N.W. and S.E., but here contained nothing of value, consisting chiefly of carbonate of iron. About 150 feet above this tunnel and several chains further S.E. an adit was driven about 330 feet along the course of the lode. Near the entrance it is about 2 feet wide, chiefly carbonate of iron, with iron and arsenical pyrites and a little fahl ore and galena. Good patches of fahl ore were met with in the tunnel, but most of the way the lode was poor, and work has been stopped. Above the tunnel the lode has been trenched up the bed of a small creek to the boundary of Section 343-93M, belonging to the Central Curtin-Davis Mining Co., and near the boundary some good ore was obtained, 7¾ tons assaying 3·9 per cent. copper and 118 ozs. silver per ton, and 18 tons seconds assaying 3·1 per cent. copper and 72 ozs. silver per ton. The second-class ore is concentrated by hand-jigging, but, owing to the brittleness of the fahl ore, this must inevitably be attended with considerable silver losses through sliming, and it would probably pay better to hand-pick more closely.

On Section 343-93M a tunnel has been driven about 100 feet along the course of the lode, bearing S. 30° E. The approach and first part of the tunnel are through sandstone and grit, which are succeeded by black slate much distorted. In places there are small bunches of fahl ore and copper pyrites, but the country is very much broken and disturbed, and the prospects are not very encouraging at present.

No. 1 Curtin and Davis Mine, Sections 246-93M, 66 acres, and 317-93M, 40 acres.—These sections occupy high ground on the E. of the Godkin Ridge, to the S. of the southern block of the Curtin-Davis Proprietary Company, the workings being situated nearly 2000 feet above sea level. About 4 chains from the northern boundary and 6½ chains from the western boundary of Section 246, a tunnel has been driven in a westerly direction to cut a lode seen outcropping on the surface about 80 feet above. The tunnel passes through coarse sandstone or grit, in places much broken, and at 93 feet from the entrance the lode was cut and driven on 20 feet N. and 70 feet S. The cross-cut (tunnel) was continued 22 feet in black slate, and near the end a lode formation was cut about 3 feet wide, striking a little W. of N., carrying a large percentage of arsenical and iron pyrites. This apparently junctions with the main lode, whose course is a few degrees E. of N. and W. of S. near the end of the south drive; the lode is here 6 or 7 feet wide, and carries a good deal of galena. Some stoping has been done over the back of this drive, and about 37 tons of first-class ore have been obtained, of an average assay value of about 10 per cent. copper and 115 ozs. silver per ton. The best of the ore is fahl ore, with which are associated jamesonite, copper pyrites, galena, and occasionally a good deal of sulphide of bismuth, the gangue being chiefly carbonate of iron. The lode in the stopes is from 2 to 3 feet wide, with in places up to 10 inches of solid fahl ore, but it is very patchy. No new ground is being opened up, but the prospects are sufficiently encouraging to warrant the driving of the south end, and it is a pity this was discontinued. In the N. end the lode was barren, and a rise was put up 77 feet in unproductive ground. Although the mine is only about three-quarters of a mile in a direct line from the Montezuma Station, the country is so broken that it is very expensive packing the ore out. These remarks also apply to the Block 291 and Central Curtin and Davis Mines. From the Curtin and Davis United the ore is packed at a cost of £1 per ton to the Curtin-Davis Proprietary Mine, and sent down the self-acting tram. The company has spent about £80 in improving the track, but it was still in a very bad state when I saw it at the end of a dry summer.

Bonnie Dundee Mine, Section 1610-93M, 54 acres.—One of the characteristic fahl ore-bearing lodes has been discovered on this section, and several small parcels of high-grade fahl ore and gossan have been obtained. The gossan sometimes shows a little native silver, and assays are said to have been obtained up to 1200 ozs. silver per ton. A tunnel has been driven about 160 feet in a southerly direction on the course of the lode, a few feet above the level of the Ring River, and one shoot of ore has been stoped nearly to the surface. In the stopes the walls are about 4 feet apart, and stand almost vertical, striking N. 10° E.; but going S. along the level, the lode turns more to the W., and underlays considerably to the W.N.W. The clean ore is very bunchy, varying from nothing up to 10 inches in width. Going S. the ground rises rapidly, and the drive should be pushed ahead as far as possible, and the country cross-cut for parallel lodes, which are very likely to exist.

Fahl Ore Mine, Section 3212-93M.—This is an 80-acre section E. and adjoining the Bonnie Dundee, which was taken up in the early days of the Zeehan Field, and has been worked at intervals since then. The original workings were situated near the S.E. corner of the section, on the right-hand bank of the Ring River. They are now full of water; but, according to an old plan

Locality.	Gold per Ton.		Silver per Ton.			Lead per cent.	Zinc per cent.
	dwts.	grs.	ozs.	dwts.	grs.		
No. 1, Open-face, average of daily assays	4	12	25	3	21	14·3	27·0
No. 2, ditto	5	0	9	1	12	16·5	23·0
No. 3, ditto	5	12	21	1	12	15·0	25·0
Tunnel	3	10	15	1	6	11·0	35·0
Gossan	10	1	31	11	11		
No. 1, Open-face, bulk sample of 2½ tons sent to England	7	20	54	4	12	8·0	21·2
No. 3, ditto, 2½ tons, ditto	6	12	9	9	11	15·0	25·0
Nos. 1 and 3, ditto, 5 tons, sent to Dapto	10	10	40	12	17	8·5	26·2
Nos. 1 and 3, ditto, 1 ton, ditto	13	1	74	14	2	14·0	28·0
Nos. 1 and 3, ditto, 5 tons, sent to England	7	20	48	12	3	8·5	23·0
No. 1, Open-face, and Tunnel, bulk sample of 5 tons sent to England	7	20	38	16	3	8·0	28·6

From the above it is seen that the ore is very variable, and though parts of it are rich enough to bear the cost of exporting, the ordinary run of ore, on which the future success of the mine chiefly depends, is too poor for this, and must be treated locally; but it has not yet been decided what method of treatment will be adopted. The percentage of zinc in the bulk of the ore is too high to admit of smelting the ore unless mixed with less refractory copper or lead ores, and although numerous wet processes have been patented for treating complex zinciferous ores, so as to recover the zinc and leave a residue containing the precious metals fit for smelting, the cost of treatment has hitherto proved too high for low-grade ores.

The Tasmanian Smelting Company are now erecting smelting-works near Zeehan, which are likely to have a very important influence on the whole district. By mixing with the lead ores from the Zeehan and Dundas Mines they will be able to work in considerable quantities of the more refractory ores, and it would probably be more advantageous for the Mount Reid Co. to thus dispose of their ore rather than erect reduction-works of their own. The cost of treatment, however, is likely to be high, and it may be mentioned that in America an extra charge of 2*s.* per ton is made by the lead-smelting companies for every per cent. of zinc over 12, so that for an ore containing 27 per cent. of zinc there would be an extra charge of 30*s.* per ton in addition to the ordinary smelting charges.

It is probable that the gold and silver are contained chiefly in the galena and pyrites, and experiments should be made by treating a few hundred tons (accurately weighed) in one of the Zeehan concentrating mills to ascertain what loss would be incurred by reducing the zinc in the concentrates down to 10 or 15 per cent. To insure success all the ores in this district will have to be economically handled; but the matter of local smelting is such an important one for the whole Colony that every inducement should be offered by reducing the freights on the Government lines to as low a rate as possible.

A survey has been made for an aerial tramway from the Mount Reid Mine to Deep-Lead, but I understand that the present intention is to connect with the ground tram which is being constructed from the Hercules Mine.

South Hercules Mine, Sections 15-95 and 23-95.—This property, comprising 19 acres, lies N. and adjoining the Mount Reid Mine. On the centre of the southern boundary between the two sections an underlay shaft has been sunk 50 feet on a body of dense sulphide ore, very free from gangue, but containing a large percentage of zinc blende, which is probably a continuation of the Mount Reid Company's ore body. In the bottom the walls are about 4 feet 6 inches apart, striking about N. 20° W., and dipping at a high angle to the E.N.E.; a drive has been started from the N. end of the shaft, but was only in a few feet at the time of my visit. A sample which I took from the back and sides of this drive yielded traces of gold and copper, 9 ozs. 6 dwts. 4 grs. silver per ton, 11·2 per cent. lead, and 22·5 per cent. zinc. This is too poor to be payable at present, but it is probable that in driving richer shoots will be encountered.

About 140 feet below the top of the shaft, and several chains to the N.W., a long cross-cut has been driven, starting on a course of N. 20° E. At 250 feet from the entrance a vein of dense iron pyrites was cut, and the schist for several feet on either side is much silicified, and has a cherty appearance.

Although the iron pyrites is said to contain nothing of value, it is probable that this is a continuation of the ore body seen in the shaft, and I should recommend driving on it N. and S. From this point the cross-cut continues about 370 feet due E., and about 10 feet from the end a little ore was cut in the bottom, and a drive put in N. 32 feet. This drive carries a little fahl ore, but the end is blank, with a little purple fluor spar showing through the schist.

To the S.W. of the main adit, on the opposite side of a small creek running N. W. through the section, is No. 2 adit, driven W.S.W. through siliceous schist. At 20 feet from the entrance "No. 2 lode" was cut, and this has been followed a little E. of S. for 60 feet. The average width

15° W.; and at 40 feet in this drive a cross-cut driven to the east shows 16 feet of gossan, with sulphide ore on the hanging-wall. Going N. sulphide ore replaces the gossan for some distance, and in places large kernels of undecomposed sulphide are seen in the gossan, making the ground very heavy. In the S. drive, 36 feet from the main cross-cut, a rise has been put up to the surface 60 feet on the underlay, all in gossan, and just beyond this a cross-cut to the E. cut the hanging-wall at about 10 feet. Going S. sulphide ore replaces the gossan and dips under foot, the face being very much broken with veins of quartz. The gossan from this tunnel is said to average about 12 dwts. gold and 20 ozs. silver per ton.

Immediately over No. 3 tunnel, and about 50 feet above it, the gossan is showing in an open cut, and a prospecting adit proved it to be here, about 20 feet wide; the adit was continued 30 feet further, but did not cut any more ore. This ore body lies considerably W. of the line of those met in the northern workings, and it would be very advisable to continue No. 3 tunnel.

No. 4 tunnel is on the same level as No. 2, the entrance being about 3 chains S.W. from No. 3. At 240 feet from the entrance a small vein of sulphide ore was cut, which on driving N. widened in a few feet to 3 or 4 feet solid ore, with a little quartz, striking about N. 10° W. At 35 feet from the cross-cut a rise has been put up about 40 feet, and I took a sample of the ore exposed, which assayed 3 dwts. 6 grs. of gold, 20 ozs. 18 dwts. 3 grs. silver per ton, 0·5 per cent. copper, 16·2 per cent. lead, and 16·5 per cent. zinc. Going N. the drive continues all in ore for some distance, the hanging-wall not being seen, but in the end, 40 feet beyond the rise, the ore is cutting out, and the country is getting very hard. This is evidently a different run of ore to that worked in No. 3 tunnel, the latter lying further E., and having an easterly underlay. A few feet beyond the N. drive a drive has been put in 30 feet S. 40° E.; a little ore has been obtained in bunches, but nothing permanent. The end is in nodular schist, which seems to be unfavourable for ore. The main cross-cut has been continued about 60 feet beyond the S. drive, the end being in kindly looking schist, with small veins of carbonate of manganese. At the mouth of the tunnel is a large pile of ore obtained from the N. drive, shewing patches of copper pyrites and a little fahl ore, which is said to average 10 dwts. gold and 20 ozs. silver per ton, and 12 per cent. lead.

About 115 feet above this tunnel is an open cut, close to the pack-track from Deep Lead. In this cut a band of sulphide ore 18 inches to 2 feet wide is seen on the western or footwall, and about 12 feet of gossan on the hanging-wall, containing a good deal of carbonate of lead, with 2 to 3 feet of schist between the two. A prospecting shaft has been started in the gossan, and at the time of my visit was down about 15 feet. The band of schist gets smaller going down, and in the bottom of the shaft solid sulphide ore is coming in on the footwall side.

The experience gained, so far, goes to show that the ore occurs in lenticular bodies generally parallel to the foliation of the enclosing schists, and it has probably been deposited along planes of weakness in a shear zone, in a similar manner to the Rosebery deposits. It is to be expected that the ore bodies will gradually cut out in depth, but, judging from the experience gained on similar deposits in other parts of the world, there is little doubt but that it will make again at a lower level. Frequent cross-cutting will be necessary at different levels to ensure that no shoots of ore are missed. Probably as the deposits are better opened up it will be found that they occur according to some general rule, and, for determining this, accurate plans of the workings with frequent cross sections will be of great assistance.

The ground falls rapidly to the W., and since my visit a fifth tunnel has been started between No. 2 and 4, but 150 feet below them. This will have to be driven a considerable distance before reaching the ore bodies seen in the upper levels, which all underlay to the E. into the hill, but it will prospect the footwall country for other parallel deposits which are very likely to be found. It is proposed to shortly introduce rock-drills, which will effect a great saving both in time and money, as some of the country is very hard for hand-drilling. Firewood is scarce, and it is probable that the Montezuma Falls will be utilized to generate electricity, which will be conveyed to the mine by cable, and either used to work electrical drills or to drive an air compressor.

A ground tramway is now being constructed to connect the mine with the N.E. Dundas Line at Deep Lead, the fall from the top of the haulage line on the Barlen Hercules Section being, according to my aneroid measurement, 1530 feet, and the length of the line is about a mile. This point is a few feet lower than the mouths of Nos. 2 and 4 tunnels, with which it will be connected by a tramway along the side of the hill.

An offer was made sometime ago by the Tasmanian Smelting Company to take 500 tons of gossan, 750 tons suphide ore, and 250 tons antimonial ore per month, on what are stated to have been very advantageous terms; but I understand that this offer has been refused, and I have been informed on good authority that the Hercules Company contemplate erecting smelting works close to the Burnie-Waratah Railway about 22 miles from Burnie, where a suitable site has been chosen, with limestone and ironstone close at hand. The sulphide ore is similar to that of the Mount Reid Mine, and the bulk of it contains too much zinc to be smelted by itself, but it is proposed to drown the zinc by mixing with clean lead ores and with the gossan from the mine. The oxidised lead ores of the Magnet Mine which are too poor to export would be very suitable for the purpose, and if the works were erected doubtless several of the mines in the Whyte River and Heazlewood Districts would be re-opened. It will be difficult to connect the mine with the Burnie-Zeehan Railway. The rise from Rosebery to the Hercules Mine is over 2000 feet, the distance in a straight line being about five miles, and the intervening country is very broken, so that an aerial tramway will probably be necessary.

Burlen-Hercules Mine, Section 30-92.—This is a small property of 10 acres lying N. and adjoining Section 100-94 of the Hercules Company, and a lot of prospecting work has been done on it, with disappointing results.

About 4½ chains from the S.W. corner of the section, close to the southern boundary, a shaft was sunk 26 feet by the original holders of the section, and from the bottom a cross-cut was driven to the E., cutting a small vein of rich sulphide ore about 130 feet from the shaft, but this soon cut out when driven on to the N. The shaft has now been connected with the surface by a cross-cut W. from the bottom about 25 feet long, and in the eastern cross-cut a little further prospecting has been done, but nothing of consequence discovered. About 2½ chains to the N.W. is No. 1 adit, which has been driven almost due E. about 370 feet through argillaceous schist, which for the first 90 feet is very much broken and disturbed. The first ore was cut at about 145 feet from the entrance, and a drive was put in 23 feet to the S. and about 6 feet to the N. In the S. drive the ore cut out in about 20 feet, and going N. it cut out almost at once. 100 feet further in, a vein of sulphide ore was cut about 2 feet wide, striking about N. 28° W. with an easterly underlay, and the course of this has been followed about 130 feet N. of the cross-cut, and 67 feet S. In the N. drive mixed sulphide ore was obtained for 45 feet, after which the ore is chiefly low-grade iron pyrites, with occasional patches of copper pyrites. A few feet from the main cross-cut a winze was sunk on the hanging-wall side, and it was expected to cut the footwall at about 20 feet, but at 39 feet a cuddy put in to the W. showed the footwall to be 6 feet away, and underlaying W. A rise has now been started, and was up about 8 feet at the time of my visit. A little ore is showing in the top which is said to assay about 7 ozs. silver and 2 dwts. gold per ton. At 50 feet a cross-cut has been driven 55 feet E.N.E., and a small vein cut carrying quartz and blende, but nothing of value.

In the S. drive the ore cut out in a few feet, but soon made again and continued to about 55 feet. In the end the country is very much broken and disturbed.

About 290 feet from the entrance of the tunnel a large burst of water was met with, and for about 9 feet there is a good deal of quartz and pyrites through the schist, but nothing payable. The end of the tunnel is within about 90 feet of the E. boundary of the section.

No. 2 adit starts about 70 feet from the western boundary, and has been driven over 400 feet parallel to No. 1, and about 90 feet below it. At 295 feet from the entrance a vein of sulphide ore (an intimate mixture of pyrites, zinc blende, and galena), about 3 feet wide, was cut, striking about N. 18° W., and a drive was put in 63 feet to the S., but the ore cut out in a few feet. From the end of this drive a crosscut was driven W.S.W. 23 feet without cutting any ore. A drive was also started N. of the main crosscut and driven about 7 feet, when the ore pinched, and the drive was discontinued. About 80 feet further in the schists are heavily impregnated with pyrites for several feet, and a drive has been put in 52 feet to the S.S.E., passing directly below the winze sunk from the upper level; 15 feet further along the main cross-cut a drive has been put in 45 feet to the N.N.W. A little low-grade sulphide ore was obtained from these drives, and in the N. drive a patch of barytes, carrying clean copper pyrites, was cut, but only lived a few feet. The end of the cross-cut is about 20 feet beyond the N. drive, in hard quartzose schist striking N.N.W. and dipping to the E N.E.

North Hercules, Sections 96-94 and 97-94, containing 20 acres held under lease for gold, and Section 200-93M, 43 acres, held under mineral lease.—A prospecting tunnel has been driven about 400 feet on Section 96-94, but no ore has yet been met with. The country rock is very hard, and does not seem favourable for the occurrence of ore.

Messrs. Twelvetrees and Petterd have made a microscopical examination of several specimens of rock from this property, and are of opinion that it is a schistose felsite or porphyroid. It probably represents an ancient lava flow or tuff interbedded with the sedimentary strata, the schistose strata being due to intense shearing action.

Similar rocks are seen on Section 234-93M belonging to the Hercules Consols Copper-Silver Mining Company, on which a prospecting tunnel has been driven about 180 feet, the country in the end showing a little pyrites, but nothing of value. On the pack-track beyond the tunnel the schist is seen slightly impregnated with pyrites, blende, and galena, but I do not know if any other prospecting work has been done, as the manager was unfortunately away at the time of my visit.

Ring River Mine, Section 252-93M, 40 acres.—A belt of pyritiferous schist passes through this section, and a good deal of work has been done on it. About 8 chains from the southern and western boundaries of the section the outcrop is seen on the hill above the pack-track to Mount Read at an elevation of 1540 feet above sea level. The country consists of argillaceous schists similar to those seen in the Rosebery District, striking a little W. of N. and dipping to the E., and for a width of about 18 feet they are impregnated with iron and copper pyrites, which appear to be making more solid underfoot. A vertical shaft was sunk 50 feet, from which some very solid ore, containing a good deal of copper pyrites, was obtained. The shaft passed through into footwall country, and from the bottom a cross-cut was driven E. about 28 feet to the hanging-wall and connected with a rise from the tunnel level 87 feet below. In this cross-cut the schists are impregnated with pyrites for about 20 feet, with bunches of solid ore, and on the hanging-wall there is a seam of solid iron and copper pyrites, about 18 inches to 2 feet wide.

No. 1 tunnel, which is 137 feet below the top of the shaft, is driven S. 55° W. about 240 feet, cutting the hanging-wall of the formation at 220 feet, and drives have been put in along the

hanging-wall 82 feet N. and 190 feet S. The end of the cross-cut is in clean footwall country, the schist containing a little ore for about 10 feet past the drive. Where cut the formation carried a good shoot of ore pitching to the N., and in the N. drive it goes under foot about 25 feet from the cross-cut; from this point to the end the drive has been unproductive.

In the S. drive, at 22 feet from the main cross-cut, a winze was sunk 15 feet and some good ore obtained, but the water proved too heavy for baling. At 38 feet is the rise 87 feet high connecting with the cross-cut from the vertical shaft as mentioned above, and 12 feet beyond the rise a cross-cut driven 22 feet to the W. passed through 3 or 4 feet of solid ore, average samples from which are said to have assayed 10 to 19 grains gold per ton, 10 to 15 ozs. silver per ton, and 21 to 24 per cent. copper. The drive continues along the hanging-wall, showing a little ore in places, and a good deal of barite. About 70 feet from the end the country is very much broken, and a cross-course dipping S. has been followed W. for about 20 feet, carrying a little soft friable ore. The country in the end of the main drive is crumpled schist, with a little pyrites through it. I took a sample from the ore exposed in this level and in the rise, which assayed traces of gold, 4 ozs. 18 dwts. silver per ton, 9 per cent. copper, and 0·7 per cent. zinc. Although low in silver, this ore would be valuable to mix with the Mt. Read or Rosebery ores. About 30 feet from the entrance of the tunnel a parallel formation carrying a mixture of blende, galena, and pyrites, was cut, and has been followed S. about 50 feet. 100 feet below No. 1 tunnel a second tunnel has been started about 5 chains from the northern boundary of the section. Its course is about S. 11° W., so that it will cut the "lode" at a very acute angle, the reason for giving it this direction being that towards the N. and E. the ground falls rather rapidly towards the Ring River, which runs through the northern part of the section. This stream is said to contain about 4 heads of water in the middle of summer, and would be very useful for driving concentrating machinery, a good fall being obtainable by going a short distance up. The mine could be easily connected with the N. E. Dundas Tramway at Deep Lead.

Ring Hercules Mine, Section 259-93M, 40 acres.—The belt of mineralised schists has been traced southward into this section. In several trenches near the top of the spur the schists are seen heavily impregnated with iron and copper pyrites for a considerable width, and it is probable that a solid body of ore will be found at a depth. The ground falls rapidly to the west, and a tunnel is being driven in an easterly direction about 2 chains from the northern boundary of the section. At the time of my visit this tunnel was in about 120 feet, but will have to be continued a good deal further before reaching the formation seen in the trenches. The country passed through in the tunnel is a siliceous schist spotted with iron pyrites.

South Jupiter, Section 1390-93M, 52 acres.—A prospecting tunnel is being driven on this section, and was in about 100 feet when I saw it. The country passed through is a hard grey spotted schist, with transverse joints, which cause it to break into large blocks. Several varieties of this rock are seen in the district, and require careful study. They are highly metamorphosed rocks, but whether originally of sedimentary or igneous origin is at present doubtful. So far as can be judged they are not favourable for the occurrence of ore.

Jupiter Mine, Sections 409-93M, and 410-93M, formerly known as Allom & Morley's.—About the centre of this property, close to the Deep-Lead Saddle, some trenching has been done across an outcrop of schist, which for over a chain in width is impregnated with iron and copper pyrites, and a tunnel is now being driven bearing S. 70° W., to cut this formation at a depth of about 125 feet. At the time of my visit this tunnel had been driven about 230 feet through greenish argillaceous schist, similar to that seen in the Tasmanian Copper Mine, striking a little W. of N., and dipping to the east. A little copper pyrites was met with at about 80 feet from the entrance, and at 125 feet a vein of fairly solid cupriferous pyrites was cut about 18 inches wide in the bottom and 6 inches wide in the back of the level, and beyond this for nearly 50 feet the schist is strongly impregnated with iron and copper pyrites, with several small veins of solid ore. From this point to the end of the tunnel the schist contained very little pyrites, but for the last few feet it is very heavily mineralised, and other veins of solid ore will probably be cut. I took a sample by chipping from the veins already cut, altogether about 4 feet in thickness, which yielded traces of gold, 2 ozs. 9 dwts. silver per ton, 9·5 per cent copper, and 0·5 per cent. zinc. These veins are well worth further prospecting, and experiments should also be made to find out what proportion of the valuable metals could be saved by concentrating the mineralised schist. To the N. of the outcrop the ground falls towards a small creek, one of the numerous feeders of the Natone Creek, and from the level of the creek an adit could be brought in about 280 feet below the outcrop.

The corded track which is now being constructed between Deep Lead and Rosebery will pass within a short distance of these workings. This track will be of great advantage to the district, and the grades should be made so that it can be converted into a cart-road if necessary.

North Jupiter, Section 1612-93M, 79 acres.—This is an irregularly shaped section lying to the west of Section 409-93M, but overlapping it on the N. and S. A tunnel has been driven about 100 feet nearly due N., parallel to the schists, which, as seen in a long trench above the mouth of the tunnel, are more or less impregnated with pyrites for a considerable width. In the tunnel a little solid ore, consisting of an intimate mixture of blende, galena, and pyrites, is seen underfoot in several

On the eastern slope, which is here very steep, a tunnel has been started, bearing S. 70° W. on the line of the western tunnel, but 140 feet lower, near the entrance, a good deal of pyrites is seen for several feet, with hematite, magnetite, quartz, and a little copper pyrites. To the S.E. of this, and 75 feet below it, a third tunnel was started and driven about 30 feet; for several feet near the entrance there is solid hematite with magnitite and iron pyrities, which is said to carry a little silver and gold, but not in payable quantities.

Since my return a new discovery has been made on one of the northern sections, from which I have seen good-looking samples containing solid copper and iron pyrites with magnetite. A good deal of ground has been pegged in this vicinity, and prospecting was being carried on on several sections which I was unable to visit. From general appearances the district seems a very promising one, and, as it is nearly all open country, prospecting will be comparatively easy, but better means of access are urgently required. The track by which I came, over the top of Mount Read, is quite impracticable for horses, but I believe that connection could be made with the pack-track from Mount Read to Dora in two or three miles with a good grade, and it would be advisable to make this at once. It is probable that a good track could also be found to the north of Mount Read, either crossing the leading spur and going to Deep Lead, or winding down into the Koonya Valley to Rosebery, and this would open up some very likely mineral-bearing country.

From the Red Hills my route lay past the S.W. corner of Lake Selina (elevation, 1725 feet above sea), thence S.E. across a large button-grass flat (probably the silted-up bed of an old lake), on to the Read-Dora track, which goes past the north end of lake Rolleston, and winds up the spur to the S.E. on to the Lake Dora Plateau. With the exception of a few belts of timber in the gullies and more sheltered spots, it is all open country covered with button-grass, and occasionally huge boulders of conglomerate are seen. The general level of the country round Lake Dora is between 2400 and 2500 feet above sea-level. To the west the ground rises to Walford Peak (3300 feet), which is separated by a rough gorge from Mount Tyndall. To the south are the conglomerate foothills of Mount Sedgwick.

In the neighbourhood of Lake Dora the principal country rocks are quartzose, micaceous, and chloritic schists, passing into slate, grits, and conglomerates. The general strike is from N. 10° W. to N. 20° W., approximately parallel to the schists in the Rosebery and Mount Read Districts, but, whereas the latter dip to the E., the Dora schists dip to the W., so that they are on opposite sides of a huge synclinal fold. As far as could be seen, the surrounding hills are all capped with conglomerate resting uncomformably on the schists. In addition to Lake Dora, which is a narrow lake about a mile long, there are numerous other smaller lakes with their longer axes lying approximately parallel to one onother. From the general configuration of the country, the rounded hummocks (Roches moutonnées), the planed-like surface of the rocks, and the huge scattered boulders of conglomerate, it is evident that the country has been subjected to glacial action, which has doubtless helped to carve out many of the deep valleys further north.

A great number of sections have been pegged on this field, but on comparatively few has any work been done.

Lake Dora Mine, Sections 729-93M and 730-93M, 160 acres.—On the east side of a ridge running N. 10° to 15° W. through the southern block Section 730-93M, a tunnel had just been started at the time of my visit, bearing S. 60° W., in a coarse grit containing occasional rounded pebbles. On the top of the ridge, 90 feet above the tunnel, a trench has been cut across a formation containing hematite with a little galena and copper pryites, but it is not well defined, and the country does not seem favourable for a good body of ore.

On the northern section near the S.E. corner, and about 50 feet from the southern boundary, a deep trench has been cut about 70 feet long, running about N. 70° E. In the west end of the trench is a hard brecciated rock gradually merging into schist, and for a width of about 25 feet there is a great deal of iron pyrites disseminated through the schists with several bands of solid pyrites, striking about N. 20° W., and a little copper pyrites is seen throughout. This is worth further prospecting, and to the N.W., near the head of a small lake, the approach has been cut for a tunnel to come in under the trench, but, as this would only give 90 feet of backs in about 350 feet of driving, it would probably be cheaper to sink a prospecting shaft on the formation and then crosscut.

About 2½ chains from the northern boundary of the section, and 11 chains from the western boundary, a trench has been cut to the S. W. about 40 feet above Lake Dora. For the whole length of the trench, which is about 55 feet long, copper pyrites is disseminated more or less all through the schist, and in some places small bunches of clean ore are seen. I took a sample by chipping from both sides of the trench for a width of about 25 feet, which contained traces of gold, 3 ozs. 18 dwts. 8 grs. of silver per ton, and 1 per cent. copper. This is too poor to send away as it is, but it might be possible to make a marketable product by concentrating, and tests should be made to find out what the loss in silver would be by bringing the copper contents up to, say, 10 per cent. It is probable that the ore will become more solid at a depth, and it would be well worth while sinking a prospecting shaft.

Royal Dora, Section 2010-93M, 78 acres.—Going N.W. from the last-mentioned trench several small trenches are seen on this section showing similar dark green chloritic schist more or less impregnated with iron snd copper pyrites. About 6 chains from the southern boundary a shaft has beeh sunk about 20 feet, close to the southern margin of a small lake, through schist splashed with

copper pyrites. The shaft is at the N.E. end of a trench about 100 feet long running S. 30° W., the schist containing a little copper pyrites all through it, but not in payable quantities. The top of the shaft is only about 40 feet above the level of the small lake before referred to, which lies about 10 feet higher than Lake Dora, and a shallow trench has been cut between the two lakes, which it was proposed to deepen for the purpose of draining the smaller one, but the cost of this work would be quite out of proportion to the advantage gained. The country seen in the trench is altered clay slate, striking about N.N.W. and dipping W.S.W. It contains a good deal of calcite, and in places a little pyrites is seen through it, but nothing of any value.

On Section 677-93M, belonging to the Lady Dora Copper Mining Company, No Liability, a prospecting shaft is being sunk close to the eastern boundary on the line of the pyrites-bearing belt seen in the Lake Dora and Royal Dora Sections. The copper contents of the schist gradually decrease going N., and at this point very little ore is seen.

On Section 2011-93M a little trenching has been done, and a few shots have been put in where the schist outcrops. The schists contain frequent nodules of calcite and blebs of quartz, and occasionally a little pyrites and galena is seen, but I saw nothing of any importance.

Dora Reward, Sections 14-96 and 15-96.—These are two 15-acre blocks at the N.W. end of Lake Dora, which were originally granted as reward claims for gold About 7 chains from the northern boundary of the northern section a tunnel has been driven W. about 60 feet. Near the entrance the schists for several feet are impregnated with pyrites, and a little pyrites is also showing in the end. At about 40 feet a small vein of solid iron pyrites was cut and followed a few feet S. 20° E., but did not prove of any value, and work has been abandoned. To the west, 70 feet above the tunnel, a few shots have been put into an outcrop of quartzose schist, striking about N.N.W. and dipping W.S.W., which for several feet is strongly impregnated with pyrites. 3 or 4 chains further north several trenches have been cut in a westerly direction showing a little copper and iron pyrites disseminated through the schist. From the west end of one of these trenches a shaft has been started, and at the time of my visit was down about 10 feet. For a width of 15 feet in this trench there is a good deal of iron and copper pyrites, with bunches of magnetite, and occasionally scales of native copper lying between the foliation of the schists, but so far nothing payable has been met with. In the shaft the country is seen to be traversed by a series of transverse joints, which might sometimes be mistaken for the walls of a lode.

Sections 752-93M and 2009-93M.—These sections, containing 121 acres, are held by the South Dora Gold, Copper, and Silver Mining Co., No Liability, and a good deal of prospecting has been done on the northern block, Section 752-93M, which is west and adjoining the Dora Reward sections. The principal work is a prospecting tunnel, which, at the time of my visit, had been driven about 50 feet, bearing N. 55° W. The country passed through is a somewhat compact felsitic rock, with blebs of glassy quartz, and may, possibly, be of igneous origin; but it is much altered, and its nature cannot be determined without microscopical examination. On one side of the tunnel a flat vein of broken quartz and pug is seen apparently faulting the country. To the N.W., 60 feet above the mouth of the tunnel, a small vein of copper pyrites, with malachite and azurite, is seen, and 40 feet higher up a cut has been made across a formation showing iron and copper pyrites, with the somewhat rare minerals erythrite or cobalt bloom and glance cobalt. Further attention should be paid to these minerals, as, if present in any quantity, they would be of considerable value. Both of these formations can be easily prospected from the tunnel.

On what is known as the "West Lode" a cut has been started to the S.E. showing a good deal of copper pyrites, bornite, and chalcocite, for a width of 5 or 6 feet. This ore is of low grade, a sample which I took from the face returning only traces of gold, 6 dwts. 12 grs. silver per ton, 6·2 per cent. copper, and 1 per cent. tin; but it is worth sinking on to see if the ore improves in depth. The formation has been traced for several chains to the S.E., containing chiefly iron pyrites.

On the southern section, close to the northern boundary, a trench has been cut to the N.E. through nodular schist containing a good deal of magnetite and iron pyrites, but nothing of any value.

Dora Mine, Section 676-93M, 75 acres.—Close to the southern boundary of this section a shaft was being sunk, which, at the time of my visit, was down about 30 feet, showing occasional bunches of iron and copper pyrites through the country, but nothing of any value. The shaft is sunk at the W. end of a deep trench, and for about 6 feet east from the shaft the schists, striking N.N.W. and dipping about 80° to the W.S.W. are slightly impregnated with pyrites. To the N.W. of the shaft several trenches have been cut, all showing a little pyrites through the schists, and in the most northerly one, about 10 chains from the shaft, and 90 feet above it, there is more or less iron and copper pyrites and zinc blende for a width of about 25 feet, but the indications are not very promising for the existence of a solid ore body below. To the east the country changes to a felspathic grit.

North Dora, on Section 681-93M, 80 acres.—An approach about 45 feet long has been cut and a tunnel driven S.E. about 25 feet through dark green quartzose schist, with a little copper and

iron pyrites irregularly disseminated through it. About 250 feet beyond the mouth of the tunnel, and 65 feet above it, a few shots have been put into an outcrop of schist, showing a good deal of iron and copper pyrites with stains of malachite for a considerable width. The N.W. corner of this section is about 120 feet below the tunnel, so that a lower working tunnel could be put in should anything payable be discovered in the upper one. The same company also holds Section 1074-93M, of 40 acres, lying to the N. of Section 681, and a little surface trenching has been done showing pyrites through the schist, but so far as I could see nothing of importance has been discovered.

Mount Dora, Section 735-93M, 76 acres.—This is one of the few heavily timbered sections on this field, lying on the steep slope at the S.E. end of Lake Rolleston. Work at the time of my visit was confined to trenching, near the southern boundary, to try and pick up the belt of pyritiferous schist seen in Section 681. In the northern part of the section a few shallow trenches have been cut, in which a little pyrites is seen disseminated through the schist, and in one trench several small veins of gossan were cut, with bunches of quartz carrying a little galena. The ground slopes steeply to the W., and 80 feet below this trench a tunnel was started a little N. of E., but was discontinued after driving abont 10 feet through schist, carrying a little pyrites and galena. This would be a useful prospecting work, and should be continued.

From the above brief description of the work done on this field, it is seen that it is still in the prospecting stage, and, owing to its remoteness, development is likely to be very slow.

Copper-bearing minerals, carrying a little gold and silver, have been found over a large area, and though so far nothing payable has been discovered, the surface indications in several instances are sufficient to warrant further prospecting. This is very expensive owing to the great cost of getting in supplies, and very little surface work can be done to advantage in the winter owing to the inclemency of the climate. In most cases it will be necessary to sink before the ground can be properly tested, and it would be very advisable for two or three of the companies to amalgamate and sink a good prospecting shaft. I do not think that water is likely to prove very heavy, and it is probable that a depth of 100 feet could be reached with a whim or a whip.

Should the Great Northern Railway be extended from Rosebery to Mount Lyell, it will probably pass through the gap to the west of Lake Selina, and a short branch line could easily be made to connect with the Dora Field in the event of payable ore being found in sufficient quantities.

I take this opportunity of thanking the various mine managers, to whom I am much indebted for the hospitality and kindness extended to me throughout the trip.

I have the honour to be,

Sir,

Your obedient Servant,

J. HARCOURT SMITH, *Government Geologist.*

W. H. WALLACE, *Esq.*,

Secretary for Mines, Hobart.

WILLIAM GRAHAME,
GOVERNMENT PRINTER, TASMANIA.

TASMANIA.

REPORT

OF THE

SECRETARY FOR MINES

FOR

1898-9,

INCLUDING THE REPORTS OF THE INSPECTORS OF MINES, THE COMMISSIONERS OF MINES, THE GOVERNMENT GEOLOGIST THE MOUNT CAMERON WATER-RACE BOARD, &c.

Tasmania:
JOHN VAIL, GOVERNMENT PRINTER, HOBART.

1899.

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REPORT OF THE SECRETARY FOR MINES.

Mines Department, Hobart, 11th August, 1899.

SIR,

I HAVE the honour to submit my Report upon the Mines Department, and the progress of the Mining Industry of the Colony, for the year ending the 30th June, 1899.

Appendices.

Appended will be found Reports from the Commissioners on the condition of the Mining Industry in the Divisions under their charge; the Reports of the Inspectors of Mines; the Annual Report of the Mount Cameron Water-Race Board; a Report on the Tasmanian Smelting Company's Works, with a plan of the works; the Mount Lyell Mining and Railway Company's Works; a Report on the Magnet Silver Mine; the Government Geologist's Reports on the Bell Mount and Middlesex Mineral Fields, on the Penguin and Dial Range Mineral Fields, on the discovery of Gold at Port Cygnet, and on the Alluvial Tin Mines at Derby; Papers by Messrs. Twelvetrees and Petterd on Limurite in Tasmania, Haüyne-Trachyte and allied rocks in the Districts of Port Cygnet and Oyster Cove; Notes on Humeri of Tasmanian Labyrinthodonts; the Felsite and associated rocks of Mount Read and vicinity; Supplementary Note on Limurite in Tasmania, Nepheline and Melilite Rocks from Shannon Tier, and on Mesozoic Dolerite and Diabase in Tasmania; Returns showing the operations of the Diamond Drills; the Examination Papers set at the Examination for Mine Managers' Certificates; and Returns showing the yield of Gold, Coal, Tin, Silver ore, Blister Copper, Copper ore, and Iron ore; the Number of Persons engaged in Mining; the Number of Leases and Area of Land held under lease for mining purposes; the Net Revenue paid to the Treasury from Mines; the Number of Miners employed during the year; and the Total Amount of Rents and Fees received by the Department during the year.

General Remarks.

It is very gratifying to note that the rapid progress of the mining industry which was recorded in my last Annual Report has been fully maintained during the year just closed, and mining throughout the Colony is in a very satisfactory condition.

The rise in the London market price of tin, which has exceeded £48 10*s*. per ton during the year, has given a great impetus to the tin-mining industry, and has induced prospectors to go out in search of new ground, while some of the old abandoned alluvial tin-fields have been retaken up with every prospect of paying handsomely while the price of tin remains so high. In order to encourage the industry, large areas of tin-bearing country have been allowed to be taken up under prospectors' licences, free of rent, for periods of six months, renewable upon proof being supplied that *bonâ fide* operations have been carried on during that period; and this has resulted, in many instances, in the discovery of payable tin deposits, and a large number of sections have been taken up under lease.

Prospecting operations are still being carried on in many places with most encouraging results, and it is only reasonable to expect that during the next year the output of tin will be very considerably increased.

Many river claims have been applied for during the year, and this new industry is likely to prove very successful in some of our rivers.

The Tasmanian Tin Dredging Company have just completed the pontoon and erected machinery thereon, and are about to start active operations on the Ringarooma River at Derby.

Although the dredge has, so far, only had a trial to test its suction-pump and machinery, and has a large accumulation of tailings to treat before reaching the natural bed of the river, most encouraging results were obtained.

Dredging claims have also been applied for along the foreshore at St. Helen's Point and Medea's Cove, George's Bay. The ground has been thoroughly tested by prospecting shafts and bores, from which good results have been obtained.

The total value of minerals and metals raised during the year is £1,277,740, being an increase of £361,857 as compared with the previous year, and the amount paid in Dividends is £282,700 15*s.*

The amount of revenue received by the Department for the year ending 30th June, 1899, is £24,696 10*s.* 5*d.* The quantity of gold won is 84,189½ ozs.; of this amount, 24,823 ozs. has been obtained from the blister copper from the Mount Lyell Mining and Railway Company's mine.

Mount Lyell.

The Mount Lyell Mining and Railway Company have exported during the year 6079 tons of blister copper, an increase of 1017 tons over the previous year. The future prospects of this mine are most encouraging. A winze put down 25 feet from the No. 5 tunnel is in good ore, which gave a bulk assay of 14 per cent. copper, 17 ozs. silver, and 3 dwts. of gold per ton.

The aerial trams are working satisfactorily, and about 800 tons of crude ore are treated every 24 hours.

Further particulars will be found in a report from the General Manager attached.

At the North Lyell Mine the principal work is opening up on the surface, so that the mine can be worked upon the open cut principle. I believe it is the intention to discontinue sending their crude ore to London for treatment.

The Lyell Tharsis Company have completed their aerial tramway and are working two shifts, sending about 100 tons of ore daily to the smelters at Queenstown.

The South Tharsis Mine is looking very well. The Company are erecting a very extensive concentrating plant for treating the ore before sending it to the smelters.

There are several other mines at work, particulars of which will be found in Mr. Commissioner Fowell's Report, which is appended.

Mount Zeehan.

Mining operations in this district have been very satisfactory during the past year. There has been an increase in the output of silver-lead ore of nearly 9000 tons. This is mainly owing to the completion of the Tasmanian Smelting Company's works, a market being thus established for the sale of low-grade ore, which would not pay to export. This Company during the year purchased 11,863 tons of ore, valued approximately at £32,060, and employs 150 men, irrespective of those employed at the lime quarries and in wood-carting.

Dundas.

With the exception of the Comet Mine, which delivers about 250 tons of ore per month to the smelters, very little work is being done in this district.

Mount Bischoff.

The output of ore from the Mount Bischoff Tin Mine was 1839 tons, and the amount paid in dividends £55,500. The total amount of tin ore obtained since the formation of the Company is 54,462 tons, and the total amount paid in dividends is £1,564,500, being equal to £130 7*s.* 6*d.* per share.

The Magnet Silver Mine, which is situate about seven miles from Waratah, is now making good progress. The total quantity of ore exported is 581½ tons, net value £7462. It is fully expected that within a few months this mine will be able to sustain an output of 200 tons of 1st class ore per month. Appended is a report upon the progress of this mine, which has been supplied by the legal manager, Mr. G. L. Meredith.

North-West Coast.

A few men are employed at the Blythe River Iron Mine, and the owners have just completed the survey of a tramway from the mine to connect with the Emu Bay Line at Burnie.

The tramway will be about 6½ miles in length, and when completed, this mine will add very considerably to the output, which at present averages only about 170 tons a month.

At Middlesex Plains, Bell Mount, Forth, &c., many prospectors are engaged in exploring the region. There are at present only about four settled mining operations, but the only one demanding special notice is that known as the Shepherd and Murphy Mine. Although the mine contains several associated metals, its present principal yield is tin and bismuth. Some 500 tons of ore are estimated to be in sight, and 600 tons of ore have been mined and are ready to be dealt with, and about 300 tons have been sent away by means of pack-horses; but little progress can be made until the difficulties of transit can be overcome by means of a road.

Beaconsfield.

The yield of gold from the Tasmania Mine is 28,137 ounces, an increase of 1969 ounces over the previous year. The total quantity of ore crushed since the formation of the Company is 388,925 tons; total quantity of gold obtained, 457,475 oz. 14 dwts. 7 grs., value £1,664,432 13*s.* 4*d.*; and the total amount paid in dividends, £694,071 15*s.*

There are eight other mines doing prospecting work on this field at various depths from the surface.

A strong Company has been formed in Victoria for the purpose of working the extensive deposits of asbestos in the vicinity. The quality of the asbestos is said to be superior to that produced in other parts of the world. Should it prove to be so, there can be little doubt as to the importance of the enterprise.

Lefroy.

The only mines at present which have attained any depth are the Volunteer and New Pinafore Companies, and all hopes for the future of this field are centred in the efforts of those mines.

The former has been prospecting at the 1300 feet level, and the latter at the 1250 feet level. Should they succeed in obtaining gold at such a depth it would be an incentive to the other mines in the locality, which were once so prolific to a depth of 400 feet, to resume operations.

There are at present about 133 men employed in mining and prospecting on the field.

The amount of gold won for the year is 2145 ounces.

North-Eastern Division.

At Mount Victoria mining operations have been carried on in a very satisfactory manner on several of the claims.

Extensive and costly works are being erected by the Ringarooma Gold Mining Company, with a view of thoroughly opening out the mine so that it can be worked economically and successfully. Electric pumping and winding plants are being erected for this purpose. This company also holds 300 acres of freehold land at New River, upon which gold reefs have been found, and so far have proved payable.

Several other claims in the vicinity are making satisfactory progress.

The quantity of gold obtained was 2273 ounces from 2397 tons of quartz crushed.

At Branxholm much activity is shown in tin-mining, a large number of claims being at work in the neighbourhood of Ruby Flat.

The Arba Company are repairing their water-races at considerable cost, and intend working their claims upon a much larger scale.

At Derby and Brothers' Home the principal tin mines have been continuously worked. The Briseis and New Brothers' Home Companies are surveying races to bring in an abundant supply of water from the Upper Ringarooma River. The yield of tin from the Krushka Brothers and Brothers' Home Mines continues satisfactory. At Moorina a large number of old abandoned claims have been taken up again, consequent upon the advance in the price of tin, and this field is once again yielding very fair returns.

A large area of country in the vicinity of the Ringarooma River has been taken up under Prospectors' Licences, and prospecting for tin by boring is being actively carried on in some of the low-lying flats with most encouraging results. There is a very promising future before this

district. The quantity of tin ore obtained was 887 tons, being an increase of over 118 tons on the previous year.

Eastern Mining Division.

At Mathinna the New Golden Gate Mine is still holding its own, the yield of gold is very little short of last year. This mine is down 1330 feet, and still in a large body of payable stone.

The quantity of gold obtained during the year was 19,690 ounces, value £77,624; dividends paid, £37,600. The total quantity of gold obtained is 134,452 ounces, and the amount paid in dividends £235,200.

Many other claims are being worked in and near Mathinna, with good and encouraging prospects, and a large amount of dead work is being done.

At Fingal the Miami Mine has done a lot of dead work, and expended a large sum in labour, &c., the number of men employed being about 34.

The West Miami and Lady Dora Mines are doing prospecting work with favourable prospects.

Mangana.—The Mangana (Tasmania) Gold Reefs, Limited, are at present erecting machinery at the main shaft, which is down 210 feet. Some very rich specimens of gold have been obtained from this mine.

Several other Companies are working in the vicinity, and about eight men are making good wages by working the alluvial ground about the gullies.

At South Mount Victoria a large area of land has been applied for, and several sections are being worked with encouraging results.

Ben Lomond.—At the Rex Hill Mine twenty-six men are employed, and during the year they have sunk a winze 40 feet from the adit, and driven 40 feet in good tin stone. At the end of the drive two chambers have been worked about 70 feet by 60 feet, with a pillar left in the centre for support. The ore, which used to be hauled up by a hand windlass, is now drawn up an inclined haulage line of about 1 in 3, which reaches to the bottom of the chamber.

A large dam has been constructed on Buffalo Creek, about three miles north of the mine; 14 chains of fluming have been erected, and about half a mile of race cut to convey water to the battery.

A ten-head battery, four classifiers, four jiggs, and two frue vanners have been erected.

At Storey's Creek, crushing and concentrating plants are being erected to treat wolfram. After crushing, the ore will be hand-streamed. The output of ore up to the present has only been 2½ tons, hand-picked; value, about £26 per ton.

A large area of tin ground has been prospected and taken up in the vicinity of Avoca.

Mount Nicholas.—The Mount Nicholas and Cornwall collieries have continued steadily at work, and have obtained about 39,141 tons of coal. These mines have considerable trouble through down faults occurring. The number of men employed is about 435.

At Bicheno a large area of land has been withdrawn from the operation of "The Crown Lands Act" and "The Mining Act," in the interest of the Morning Star Coal Company, who, I believe, intend to introduce a Bill during the present session of Parliament upon lines somewhat similar to the East Coast Coal and Harbour Company's Act, passed some years ago.

Scamander River.—The Copper and Silver mines in this locality are again attracting attention, and a number of sections have been again taken up.

At St. Helen's a large extent of land has been taken up for tin near St. Helen's Point and along the foreshore of George's Bay. For some months prospecting has been carried on, and about 30 prospecting holes, from 6 to 14 feet deep, and 45 bores from 6 to 25 feet, have been put down, from all of which I am informed excellent results have been obtained. It is intended to work this property by suction dredges.

Blue Tier.—The Anchor Tin Mine has treated during the year about 18,300 tons of ore, and has obtained 62 tons of tin ore, valued at £4464. The number of men employed was 96.

The Liberator, Cambria, and Australian mines are working with very good results. Further particulars will be found in the Reports of Mr. Inspector Griffin and Mr. Commissioner Dawson.

New Discoveries.

During the year Reward Claims have been applied for as follow :—Gold—Flinders Island and Scottsdale ; Silver—Bathurst Range, Liena, and Rinandina ; Copper—Barn Bluff, Mount Sadler, Nelson River, Sandy Cape, and Whale's Head ; Tin—Flinders Island ; Wolfram—Scamander Range.

Quarterly Reports.

Quarterly Reports on the Mining Industry of Tasmania, compiled by the Government Geologist, have been regularly printed and distributed all over the world ; while a large number is also regularly forwarded to the Agent-General in London for free distribution.

Mine Managers' Examination.

Three candidates presented themselves at the examination held in March last ; one candidate succeeded in obtaining a second class certificate.

Appended will be found copies of the examination papers set.

Zeehan School of Mines and Metallurgy.

The number of students attending the school regularly during the year has averaged 35. The average attendance at the various classes has been as follows :—

Mathematics	12	Students.
Applied Mechanics	6	ditto.
Mineralogy	6	ditto.
Geology	6	ditto.
Ore Dressing	4	ditto.
Theoretical Chemistry	15	ditto.
Analytical Chemistry	14	ditto.
Fire Assaying	10	ditto.

At the beginning of 1899 Mr. R. Montgomery was appointed instructor in Mathematics. Classes are now held four nights a week in this subject, thus enabling the students to devote much more time to it than previously, and also allowing more time to be devoted to Mechanics and Mineralogy.

Many important additions have been made to the Laboratory during the last year, and the space available for chemical benches is completely taken up. The present building cannot accommodate more students in this subject than are at present in attendance. A brick fume cupboard has been erected, and water laid on throughout the Laboratory.

The Committee obtained a very complete collection of minerals and rocks from the Frieburg School of Mines. They have also purchased a collection of crystal models. These collections are proving of great assistance in the Mineralogy and Geology classes. In the second vacation of 1898 a students' Geological excursion was made to Mount Lyell and Queenstown. Twenty-one students availed themselves of the opportunity of making the trip, which proved most instructive. The students visited the smelting works of the Mount Lyell Mining and Railway Company, also the Mount Lyell, North Lyell, King Lyell, and Lyell Tharsis Mines, and were most courteously treated by the officials of the various works and mines, who took the greatest pains in explaining the various processes and the geological features of the ore bodies.

Mineral Products.

The following Return shows the quantity and value of the Minerals and Metals obtained during the year :—

	Quantity.	Value. £
Gold	84,189½ ozs.*	331,414
Silver	24,203¼ tons	217,735
Tin	2006¼ ,,	189,847
Coal	44,141 ,,	37,915
Blister Copper	6079 ,,	467,268†
Copper Ore	1889 ,,	31,985
Iron Ore	1633 ,,	1576
		£1,277,740

* Including 24,823 ounces obtained from the blister copper from the Mount Lyell Mine. †The value of the gold obtained from the blister copper has been deducted from this amount.

This shows an increase in the value of £361,859 on the previous year.

The amount paid in dividends was £282,700 15*s.*

Departmental Staff.

During the year the Department has again sustained a very severe loss through the death of one of its most prominent officials. I refer to Mr. James Harcourt Smith, B.A., Government Geologist and Chief Inspector of Mines. Mr. Smith was a young man, and a native of Tasmania, just entering a career of great promise, having obtained a good knowledge of the geology of Tasmania, and gained the confidence of the Department and the mining community. Owing to his death, which occurred while on a visit of inspection of the mineral deposits on Flinders Island in June last, his annual Reports as Government Geologist and Chief Inspector of Mines are not appended.

Owing to the vacancy caused through the death of the late Government Geologist and Chief Inspector of Mines, the Department called for applications for the vacant position, and out of 23 applications, in which all the Australian Colonies were represented, selected Mr. William Harper Twelvetrees, F.G.S., of Launceston. This gentleman is a native of England, and received his education in Germany, and for several years was in charge of copper mines and smelting works in Russia. He has travelled widely in Europe, studying the geology of Austria, Servia, Roumelia, Turkey, and many other places, and for the last eight years has resided in Tasmania, and has made himself well acquainted with its geological features.

Several valuable and interesting papers on the igneous rocks, &c., of Tasmania, prepared by Mr. Twelvetrees, in conjunction with Mr. W. F. Petterd, are, with their kind permission, appended.

The work of the Department has increased very considerably during the year. 5754 letters have been received and replied to, being an increase of over 600 on the previous year, and 960 instructions for surveys have been prepared and forwarded to the Surveyor-General for issue to the surveyors. In the drafting room, in which three draftsmen only are employed, 40 plans have been prepared for the lithographer, 14 of which were new compilations, and 1070 diagrams in duplicate have been drawn on leases, which have been engrossed by the two engrossing clerks.

I have once again to record my sincere thanks to the officers of the Department for their loyal support during the year, especially to those who, through pressure of work, have willingly remained long after office hours to keep their work up to date.

Mount Cameron Water-race Board.

The report of the Board is annexed.

Diamond Drills.

Details of the work done by these machines are appended.

In conclusion, I have much pleasure in reporting that the mining industry has made rapid progress during the year; old abandoned fields have been taken up again and vigorously and successfully worked; new discoveries are constantly being reported; foreign capital is being largely introduced into the mines; and investors and capitalists are daily gaining confidence in the mineral resources of the Colony. Altogether the outlook for the future is most promising.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. WALLACE, *Secretary for Mines.*

The Hon. the Minister for Mines.

DIAMOND DRILLS.

Statement of Work done to 30th June, 1899.

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance bored.	Average cost per foot, inclusive of Labour and Fuel.
	No. 1 Drill.			feet.	£ s. d.
1882–3	Back Creek—For Gold	Vertical	7	1330	0 10 9
1883	Lefroy—For Gold	Ditto	4	1011	0 5 3
1884	Tarleton—For Coal	Ditto	1	401	0 5 6
1886	Longford—For Coal	Ditto	2	1585	0 4 0½
1886–7	Harefield Estate—For Coal	Ditto	1	725	0 6 5
1887	Cardiff Claim, Mt. Malcolm—For Coal	Ditto	1	562	0 17 11¾
1888	Killymoon Estate—For Coal	Ditto	1	504	0 4 7¾
1888–9	Seymour—For Coal	Ditto	5	2266	0 7 8½
1889 / 1890	Beaconsfield (Phœnix G.M. Co.)—For Gold	Ditto	1	781	2 0 2
1890	Beaconsfield (East Tasmania G.M. Co.)—For Gold	Ditto	1	978	0 14 9½
1891	Spring Bay—For Coal	Ditto	4	937	0 6 10
1891	Ravensdale—For Coal	Ditto	1	114	0 11 1½
1891–2	Back River, Prosser's Plains—For Coal	Ditto	2	854	0 6 1¾
1892–3	Lefroy (Deep Lead Syndicate)—For Gold	Ditto	4	979	0 15 9
1893	Lefroy (East Pinafore Co.)—For Gold	Ditto	1	317	0 10 3
1895–6	Sandfly—For Coal	Ditto	4	2130	0 11 5
1898–9	Blue Tier (Anchor Co.)—For Tin	Ditto	3	265½	Still working.
	Total		43	15,739½	
	No. 2 Drill.				
1882	Beaconsfield—For Gold	Horizontal, underground	1	68	No record.
1883	Mangana—For Gold	Ditto	1	546	0 15 1
1884	Guy Fawkes Gully, near Hobart—For Coal	Vertical	1	612	0 5 6
1885	Malahide Estate, near Fingal—For Gold	Ditto	5	1397	0 5 6
1886	Carr Villa, near Launceston—For Coal	Ditto	1	571	0 5 4
1886–7	Waratah (Mount Bischoff Alluvial T.M. Company)—For Tin	Ditto	7	1548	0 6 1½
1887	Waratah (Mount Bischoff T.M. Co.)—For Tin	Ditto	7	841	0 11 8
1887	Ditto	Horizontal, underground	1	53	0 7 8
1888	Old Beach—For Coal	Vertical	1	593	Abt. 0 10 9
1888	Campania—For Coal	Ditto	1	600	0 7 7½
1888	Richmond—For Coal	Ditto	1	500	0 5 1½
1889	Back Creek—For Gold	Ditto	4	787	0 8 5½
1891	Macquarie Plains—For Coal	Ditto	2	989	0 4 5½
1891	Jerusalem—For Coal	Ditto	1	344	0 4 9½
1892	Langloh Park—For Coal	Ditto	4	1249	0 5 3½
1893	Southport—For Coal	Ditto	1	612	0 5 3
1894	Zeehan (Tasmania Crown S.M. Co.)—For Silver	Horizontal, underground	2	319	1 0 2½
	Total	...	41	11,629	

Aggregate number of bores..... 84
Total distance bored..... 27,368½ feet.

W. H. WALLACE, *Secretary for Mines.*

Hobart, 30th June, 1899.

No. 1.

COMPARATIVE Statement of Gold won during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, *and the first Half-year of* 1899.

YEAR.	QUANTITY.	VALUE.
	ozs. dwts.	£
1880	52,595 0	201,297
1881	56,693 0	216,901
1882	49,122 6	187,337
1883	46,577 10	176,442
1884	42,339 19	160,404
1885	41,240 19	155,309
1886	31,014 10	117,250
1887	42,609 3	158,533
1888	39,610 19	147,154
1889	32,332 13	119,703
1890	20,510 0	75,888
1891	38,789 0	145,459
1892	42,378 0	158,917
1893	37,687 0	141,326
1894	57,873 0	217,024
1895	54,964 0	206,115
1896	62,591 0	237,574
1897	77,131 0	296,660
1898	74,233 0	291,496
1899, for the first Half-year	39,556 0	154,093
TOTALS	939,847 19	3,564,882

No. 2.

RETURN showing the Quantity of Gold obtained from Quartz during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, *and the first Half-year of* 1899.

YEAR.	QUANTITY.	VALUE.
	ounces.	£
1880	34,345	130,622
1881	45,776	174,956
1882	36,215	137,183
1883	36,672	138,060
1884	30,540	114,630
1885	33,266	124,234
1886	25,004	87,516
1887	33,427	123,453
1888	34,156	126,139
1889	33,069	116,517
1890	17,829	64,184
1891	33,659	126,221
1892	34,386	128,947
1893	30,163	113,111
1894	52,239	195,896
1895	51,628	193,605
1896	59,453	222,948
1897	74,937	288,432
1898	72,080	283,422
1899, for the first Half-year	34,134	135,714
TOTALS	802,978	3,025,790

No. 3.

QUANTITY and Value of Coal raised during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, *and the first Half-year of* 1899.

YEAR.	QUANTITY.	VALUE.
	tons	£
1880	12,219	10,998
1881	11,163	10,047
1882	8803	7923
1883	8872	7985
1884	7194	6475
1885	6654	5989
1886	10,391	9352
1887	27,633	24,870
1888	41,577	37,420
1889	36,700	33,030
1890	50,519	45,467
1891	43,256	38,930
1892	36,008	32,407
1893	34,693	27,754
1894	30,499	24,399
1895	32,698	26,159
1896	41,904	33,523
1897	42,196	33,757
1898	47,678	38,256
1899, for first Half-year	19,841	18,361
TOTALS	550,498	473,102

No. 4.

QUANTITY and Value of Tin exported from Tasmania during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, *and for the first Half-year of* 1899, *compiled from Customs Returns only.*

YEAR.	TONS.	VALUE.
		£
1880	3954	341,736
1881	4124	375,775
1882	3670	361,046
1883	4122	376,440
1884	3707	301,423
1885	4242	357,587
1886	3776	363,364
1887	3607½	409,858
1888	3775¼	426,321
1889	3764	344,941
1890	3209¼	286,368
1891	3235	291,715
1892	3174	290,083
1893	3128½	260,219
1894	2934	198,298
1895	2726¾	167,461
1896	2700	159,036
1897	2423½	149,994
1898	1972	142,046
1899, for first Half-year	961	107,263
TOTALS	65,205¾	5,720,975

No. 5.

QUANTITY and Value of Silver Ore produced in Tasmania during the Years 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, *and the first Half-year of* 1899.

YEAR.	QUANTITY.	VALUE.
	tons.	£
1888	417	5838
1889	415	7044
1890	2053	26,487
1891	4810	52,284
1892	9326	45,502
1893	14,302	198,610
1894	21,064	293,043
1895	17,980	175,957
1896	21,167	229,660
1897	18,364	200,167
1898	15,320	188,892
1899, for the first half-year	15,882	114,577
	141,100	1,538,061

No. 6.

QUANTITY and Value of Blister Copper exported from Tasmania during the Years 1896, 1897, 1898, *and the first Half-year of* 1899.

YEAR.	QUANTITY.	VALUE.
	tons.	£
1896	41½	1245
1897	4700	322,500
1898	4955½	400,668
1899, for the first half-year	3358	316,101
	13,055	1,040,514

No. 7.

QUANTITY and Value of Copper Ore exported from Tasmania during the Years 1896, 1897, 1898, *and the first Half-year of* 1899.

YEAR.	QUANTITY.	VALUE.
	tons.	£
1896	34	1020
1897	75	2250
1898	394	8128
1899, for the first half-year	1546	25,387
	2049	36,785

No. 8.

QUANTITY and Value of Iron Ore exported from Tasmania during the Years 1897, 1898, *and the first Half-year of* 1899.

YEAR.	QUANTITY.	VALUE.
	Tons.	£
1897	894	812
1898	1598	1598
1899, for the first half-year	987	930
TOTAL	3479	3340

No. 9.

RETURN showing the Number of Persons engaged in Mining during the Years 1880 *to* 1898 *inclusive, and first Half-year of* 1899.

YEAR.	NUMBER.	YEAR.	NUMBER.
1880	1653	1891	3219
1881	3156	1892	3295
1882	4098	1893	3403
1883	3818	1894	3433
1884	2972	1895	4062
1885	2783	1896	4350
1886	2681	1897	4510
1887	3361	1898	6052
1888	2989	1899, first half-year	6484
1889	3141		
1890	2868		

No. 10.

RETURN showing the Number and Area of Leases held under "The Mining Act, 1893," *in force on* 30*th June of each year since* 1895.

Nature of Lease.	In force on 30th June, 1895.		In force on 30th June, 1896.		In force on 30th June, 1897.		In force on 30th June, 1898.		In force on 30th June, 1899.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
		ACRES.		ACRES.		ACRES.		ACRES.		ACRES.
For Tin, &c., at a rental of 5*s.* an acre	720	31,207	738	33,077	1150	56,493	1290	66,981	1207	64,339
For Coal and Slate, at a rental of 2*s.* 6*d.* an acre	37	6551	37	5946	38	6105	41	5943	39	6002
For Gold, at a rental of 20*s.* an acre	455	4366	602	5712½	615	5789	702	7190	652	6725
Water Rights, Mineral and Gold	176	755 sluice-heads.	160	808 sluice-heads.	155	774 sluice-heads.	159	784 sluice-heads.	200	933 sluice-heads.

No. 11.

RETURN of the Number and Area of Leases under "The Mining Act, 1893," in force on the 1st July, 1898, issued during the Year ending 30th June, 1899, cancelled during the Year ending 30th June, 1899, and remaining in force on 30th June, 1899.

Nature of Lease.	In force on 1st July, 1898.		Issued during Year ending 30th June, 1899.		Cancelled during Year ending 30th June, 1899.		In force on 30th June, 1899.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.
		Acres.		Acres.		Acres.		Acres.
For Tin, &c., at a rental of 5*s.* an acre	1290	66,981	612	37,130	695	39,772	1207	64,339
For Coal and Slate, at a rental of 2*s.* 6*d.* an acre	41	5943	6	667	8	608	39	6002
For Gold, at a rental of 20*s.* an acre	702	7190	235	2178	285	2643	652	6725
Water Rights, Mineral and Gold	159	784 sluice-heads.	60	315 sluice-heads.	19	166 sluice-heads.	200	933 sluice-heads.

No. 12.

COMPARATIVE Statement of Net Revenue from Mines, being Rents, Fees, &c., paid to the Treasury for the Year ending 30th June, 1899.

YEAR.	AMOUNT.			YEAR.	AMOUNT.		
	£	*s.*	*d.*		£	*s.*	*d.*
1880	8944	5	11	1890	26,955	4	9
1881	20,936	5	5	1891	37,829	16	5
1882	23,077	1	9	1892	17,568	18	4
1883	15,439	14	5	1893	16,971	9	2
1884	6981	11	10	1894	16,732	7	7
1885	11,070	5	7	1895	15,323	1	9
1886	12,523	10	4	1896	20,901	13	2
1887	14,611	11	5	1897	25,631	0	3
1888	23,502	8	4	1898	33,661	13	9
1889	17,254	9	0	1899	24,696	10	5

The above Statement does not include Stamp Duties upon Transfer of Leases and Registration of Companies, or the Tax payable upon Dividends, from which sources large sums are derived.

TOTAL Number and Area of Leases in force on 30th June, 1899.

MINERALS.	NUMBER.	AREA.
		Acres.
Gold	652	6725
Silver	406	20,850
Tin	238	8684
Coal	21	3243
Iron	7	428
Limestone	15	1727
Lithographic Stone	2	417
Slate	2	715
Nickel	1	40
Wolfram	5	280
Asbestos	5	316
Precious Stones	1	80
Copper	100	5864
Minerals	440	27,280
Marble	1	317
Graphite	2	100
TOTAL	1898	77,066

AVERAGE Number of Miners employed during the Year ended 30th June, 1899.

	EUROPEANS.	CHINESE.
Northern and Southern Division	944	...
North-Eastern Division	272	180
Eastern Division	599	63
North-Western Division	297	...
Western Division	3825	...
	5937	243

MINING Companies registered during the Year ending 30th June, 1899.

NUMBER OF COMPANIES.	CAPITAL.
41	£91,162

TOTAL Area of Land applied for during the Year ending 30th June, 1899.

MINERAL.	NO. OF APPLICATIONS.	AREA.
Gold	293	2637
Silver and other Minerals	444	25,318
Tin	291	9735
Coal, Limestone, &c.	5	350
TOTAL	1033	38,040

In addition to the above, 77 applications for Dredging Claims, 31 applications for Mining Easements, and 131 applications for Water Rights (612 sluice-heads of Water) were received.

TOTAL Amount of Rents, Fees, &c., received by the Mines Department during the Year ending 30th June, 1899.

HEAD OF REVENUE.	AMOUNT.
	£ s. d.
Rent under "The Mining Act, 1893," for Gold	5969 8 9
Fees " " "	708 6 6
Rent " " for Minerals	15,544 9 9
Fees " " "	2470 10 2
Survey Fees	4788 14 6
Rent of Diamond Drills	3 15 3
TOTAL	£29,485 4 11

(No. 69.)

MINE MANAGERS' EXAMINATION.

MARCH 28TH, 29TH, AND 30TH, 1899.

Questions set.

SECTION A.—MINING.

1. What precautions would you observe in approaching old workings full of water by means of a drive?
2. Under what conditions do you consider the employment of rock-drills economical?
3. Name the most common and dangerous gas in the lode mines of this Colony, and how is its presence detected?
4. In this Colony, and also in the other Australian Colonies, it has been observed that when north winds prevail many mines are troubled with foul air. Give reasons why gases accumulate under the conditions mentioned, and describe fully some mode recently adopted by some of the mines of Victoria for removing foul air.
5. Describe the conditions under which deep-lode mining can be conducted more economically by the underlay shaft system than by vertical shafts.
6. Make a sketch plan and section of any displacement of lodes that has come under your notice.
7. In a mining district, where lodes have proved payable to a depth of 1000 feet, it is intended to sink a new vertical shaft for the purpose of working three lodes striking N. and S. and underlying E.—
   (*a*) In what direction from outcrops, and at what vertical depth, should lodes be intersected in the shaft?
   (*b*) State dimensions of shaft required for working lodes mentioned in question (1), assuming it is intended to install a 16″ Cornish pump. State also the dimensions of each compartment of such shaft; the most suitable distance between levels; the height, length, and width of plunger plats.
   (*c*) State the vertical distance in shaft at which plunger workings are usually fixed, and the reason why.
   (*d*) In the event of underground balance-bobs being used, at what depths should they be fixed, and the height and length of bob-plats?
   (*e*) Assuming it is intended to mine to a depth of 2000 feet, and that 16″ Cornish pumps are to be used, state the most suitable material for main rods, and dimensions of same, and the length, width, and thickness of strapping-plates required.
8. Describe the different modes of shaft-timbering with which you are acquainted, and state some of the advantages and disadvantages of the several modes described.
9. Assuming rotten ground is encountered in sinking a main shaft at the point or depth it is intended to open out, describe fully how work should be conducted preparatory to opening out.
10. When putting up a rise in rotten ground, describe in detail how you would proceed.
11. Make a rough sketch and describe a method of ventilating a drive by means of water under pressure.

SECTION B.—ORE-DRESSING AND SAMPLING.

1. Two lodes, A and B, contain ores suitable for concentration. In A the valuable portion is finely disseminated, and is only 2 per cent. to 4 per cent. of the bulk. In B the valuable ore is coarser, and is 12 per cent. to 20 per cent. of the bulk. What system of crushing and concentration would you adopt for each?
2. How would you ascertain your losses in a concentrating mill? From what parts would you take your samples, and how often?
3. Describe any automatic slime-dressing machine that you are acquainted with.

SECTION C.—MINING GEOLOGY.

1. Explain the terms:—Strike, Outcrop, Gossan, Fault, Crosscourse, Slickenside, Horse, Gangue, Tuff, Stockwork.
2. Give instances of Deep Leads in Tasmania, and explain fully how they have been formed. What deduction may be drawn from the fact that the bottom is in some instances below sea-level.
3. Distinguish between Fissure Veins, Bedded Veins, Contact Veins, and Gash Veins, and explain briefly how they have been formed.
4. In what kinds of rocks are deposits containing Copper Pyrites, Cinnabar, Cassiterite, Galena, and Gold respectively usually found, and with what minerals are they most frequently associated?
5. State your views as to the influence of depth on the productiveness of lodes.
6. State and explain Zimmerman's Law for recovering the faulted part of a lode. Illustrate your answer by diagrams showing right-handed and left-handed heaves.

Section D.—Mining Surveying.

1. Explain the terms:—Magnetic Meridian, True Meridian, Declination, Azimuth, Latitude, and Departure, and describe a method for accurately determining the True Meridian.
2. Describe the construction and mode of adjusting and using the Transit Theodolite.
3. What precautions should be taken in making a survey with the magnetic needle in the presence of iron. Write out the field notes of such a survey, having at least six stations, and show how the correct bearings of all the traverse lines may be obtained, provided any one station is free from local magnetic attraction.
4. From the bottom of a vertical shaft A, the following traverse is made:—

A to 1	bearing	63°	distance	189 feet 6 inches
1 to 2	„	153° 30′	„	72 feet
2 to 3	„	179°	„	136 feet 3 inches
3 to 4	„	195°	„	117 feet

Calculate the co-ordinates of the points 1, 2, 3, and 4, and find the distance and bearing from the top of the shaft to a point on the surface vertically above 4.

5. Explain fully how the surface and underground workings of a mine may be connected (*a*) by means of one shaft, (*b*) by means of two shafts. Illustrate your answer with diagrams.
6. The following measurements are made from the top to the bottom of an underlay shaft:—

	Bearing.	Vertical angle.	Distance measured on the slope.
First line	157°	30°	83 feet
Second line	159°	27°	130 „
Third line	156°	29°	62 „
Fourth line	160°	34°	119 „

Calculate the true bearing between the first and last stations, the vertical depth of the shaft, and the horizontal distance between the top and bottom.

7. State what adjustments are necessary for correct work in using a surveyor's level.
8. Write out Samples of Entries in a Level Book, and plot a section from same.

Section E.—Surface Work.

1. What load hanging from a 1½-inch round wrought iron rod of ordinary quality would be likely to fracture same?
2. Make sketch section for a dry rubble retaining wall that will support 12 feet in depth of tailings, and give dimensions you would employ in interests of economy and safety.
3. The boom of a Derrick Crane is set, first at an agle of 30° from the vertical, and then at an angle of 45° from the vertical; what is strain on boom in each case when a load of 10 tons is being moved? Further, what should be the sectional area provided the ultimate strength of material in boom is 2000 lbs. per square inch, and a factor of safety of 4 is adopted?
4. Make hand-sketch showing construction of fluming for a water-section of 12 square feet carried on four bearers over an opening 25 feet wide without intermediate support, and state size of beams under same condition as to material as in question 3.
5. The water in a reservoir pressing against a dam is 208 feet wide at surface, 100 feet wide at bottom and centre, and with even side-slopes, and a depth of 18 feet; what is total pressure against a line along dam 12 feet below surface of water? Give sketch and dimensions for dam to sustain pressure.
6. You desire to transport an eight-ton boiler across a chasm, and you have decided to stretch a wire rope across for this purpose, suspend the boiler to it, and draw it over. When the boiler is half-way over the rope sags down in the centre so that its two parts make an angle to each other of 170 degrees. Show graphically how you would arrive at the stress or weight on each half of the rope.
7. You have a flow of water of 11 cubic feet per second under a head of 290 feet. What theoretical horse-power is there in this water, and what practical horse-power may you expect to obtain, say by means of a Pelton wheel?
8. Show how you would calculate the spouting velocity of water under the above head, and if the Pelton wheel were 3 feet in diameter give the proper speed at which it should run when under full load. Describe the construction of a Pelton wheel.
9. What horse-power would be necessary to haul 100 tons of ore per hour up an incline 1500 yards long, rising 1 in 8, at a speed of 4 miles per hour? Give the sizes of the engines, and supply the rest of the data yourself.
10. Find the weight of a cast-iron pipe, 12 feet long overall, 18 inches internal diameter, 1¼ inches thick. Flanges, 2 feet diameter, 1½ inches thick. Neglect the bolt-holes and the stiffening-webs between. For what head of water would the above pipe be adapted if used as part of the rising main?

(No. 69.)

SUBJECT F.—BOOK-KEEPING AND MINE ACCOUNTS.

Give specimen pages of the Books you consider it necessary that the manager of a large mine should keep. Under what different headings would you make entries in the ledger?

SUBJECT G.—MINING LAW.

1. What are the regulations under Section 102 of the Mining Act, 1893, as to the storage and use of explosives in mines?
2. What are the provisions of the Mining Act, 1893, with regard to men travelling in shafts, and what is the maximum distance allowed between the stages of a ladderway?
3. What are the duties of a mining manager as to the inspection of a mine under his charge, and the testing of ropes and chains used in connection with raising or lowering men in a shaft?
4. If a lessee discovers gold on his mineral section, what steps should he take to secure the right to mine for gold?
5. In what manner is land required to be marked off before applying for a lease?
6. In what manner is a leased claim required to be marked?

REPORT OF THE MOUNT CAMERON WATER-RACE BOARD FOR THE YEAR ENDING 30TH JUNE, 1899.

5th July, 1899.

SIR,

WE have the honour to present the Report of this Board for the year ending the 30th June, 1899.

The Board wishes to express its deep sympathy on hearing of the death of the late Mr. James Harcourt Smith, Government Geologist, and to place on record the loss it has sustained by being thus deprived of his able assistance in carrying out the work of the Board.

The Board has met as frequently as occasion required.

The total receipts for the year amount to £1017 5*s.* 11*d.*, as against £629, and the expenditure to £614 0*s.* 3*d.*, as against £729 18*s.* 10*d.* during the preceding year.

The supply of water available has been more than sufficient to allow all customers the regulation allowance for nearly ten months of the year. Even in the months of January and February, owing to increased rainfall, the shortage was not so great as in preceding years.

Fixed Scale.—The charges under this scale were altered and reduced, the rate now being equal to 10*s.* per sluice-head, when the English quoted market price of tin is £100, and, for every £1 that the price of tin rises above or falls below £100, the sum of 2*d.* per sluice-head is added or deducted; thus the present cash price of water, with tin at £118 per ton, is 13*s.* per sluice-head.

When this alteration in the cash price of tin was introduced in January last, it was thought that many of the claim-holders would take advantage of it, especially so as a preference is given to cash customers when the water is scarce. The result, however, is not satisfactory, as only 223 heads were supplied at cash rates up to the end of May, since which time no water under the fixed scale has been applied for.

Race.—This has been maintained in fairly good order during the year. The flumings at the southern extension, constructed some nine years ago, are in a far advanced state of decay; repairs have already been effected, and in all probability the whole of these flumings will have to be repaired within the next two years.

Owing to the enhanced value in the price of tin, there is at the present time a credit balance of £403 5*s.* 8*d.*; and, should the present value of tin be maintained, it is probable that there will be a balance of £800 or £900 to be paid to the Public Debts Sinking Fund on the 31st December next.

The Statistics for the year are as follow:—

Average per week of claims supplied			15
Greatest number supplied in any one week			18
Present number supplied			15
Total number of heads of water supplied			4177
Tons of tin ore raised	74 tons 5 cwt. 0 qr. 20 lbs.		
Average number of miners employed—14 Europeans; 36 Chinese			50
	£	*s.*	*d.*
Total receipts for the year	1017	5	11
Cost of maintenance and management	614	0	3
Paid to Public Debts Sinking Fund, 1898	*Nil.*		
Total cost of purchase and construction	34,572	19	0

W. H. WALLACE, *Chairman of the Board.*
C. O'REILLY,
JOHN SIMPSON,
S. HAWKES, } *Members.*

The Hon. the Minister of Mines.

ANNUAL REPORTS OF THE INSPECTORS OF MINES.

Mr. Inspector HARRISON (stationed at Zeehan) reports :—

In submitting my Annual Report, I regret to state that the accident list is again a heavy one, being 8 fatal, 12 serious, and 10 non-serious.

Several complaints have been made to me during the year, and received prompt attention ; in many instances they were of a frivolous nature.

Legal proceedings were taken in three instances against miners for not reporting miss-fires ; but I only obtained a verdict against one.

Ropes and cages have been examined and tested, and several of the former condemned.

The magazines both at Zeehan and Lyell are in good order, and kept clean. Those at Zeehan must be removed in the near future, as the town is now extended to within a short distance of them. I destroyed four cases of damaged explosives during the year.

A Board, consisting of several members of the M.M.A., A.M.A., and myself, was appointed to draft a fresh code of signals for use in the mines. They received general approval, and are now in use in most of the mines in the district, and, I am pleased to say, giving satisfaction.

The Mount Lyell Mine is now treating about 800 tons of ore per day. Some idea can be formed of the extent of work going on at this mine, exclusive of the smelters, from the following figures, for year ending June 30th :—

Average number of men employed	420	
Length of driving and cross-cutting	3013 feet	
Ore despatched from open cut.....	197,617 tons	
From stopes and drives	19,719 tons	= 217,336
Overburden shifted	288,058 tons	

Amount of explosives used—B1 Powder, 50,065 lbs.; Gelignite, 30,655 lbs.; Rackarock, 32,798 lbs.; Hercules compound, 2250 lbs.; Detonators, 78,700; Fuse, 174,232 feet.

Height from lowest workings to original outcrop, 550 feet.

At the North Lyell, the manager is busy removing the overburden from the ore body. Arrangements have been completed for the delivery of a large parcel of ore to the Mt. Lyell smelters.

At the Tharsis Mine, opening up of the lode is being pushed along as fast as possible ; about 100 tons per day of silicious ore is delivered by aerial tram to smelters, at a cost for delivery of less than 1s. per ton, allowing a fair margin for wear and maintenance.

The South Tharsis will be in a position to add to the output of the field in a few months' time, as the manager is busy erecting an extensive dressing-mill capable of treating 100 tons of ore per day. There are several mines on the western slope of Lyell opening up large bodies of silicious ores, and directly the South Tharsis proves that the ore can be concentrated to advantage, mining must receive a considerable impetus in this direction.

At the South Lyell, main shaft is down over 500 feet; the manager intends to open out after another 50 feet, when he hopes to get a share of the immense body of ore that is being worked by the Mt. Lyell Co.

At the Crown Lyell, sinking and driving is going on. The prospects of this mine are good, as it is near both the North Lyell and Tharsis. There are over 20 mines on the Lyell field, all actively employed.

On the Zeehan field there has been a considerable increase in the output of ore, principally through the agency of the local smelters, who, up to the end of June, had purchased 11,489 tons, valued at £30,426 ; ore exported for year was 14,100 tons, valued at £185,805, making a total of 25,589 tons, valued at £216,231. The Western still holds the premier position. The Montana, Oonah, Argent, Silver Queen, Smith's Section, and Mt. Zeehan are all keeping up a fair output. At the Silver King, with the exception of one tribute party, there is nothing doing ; and I would respectfully draw your attention to the very large area of ground that this company is keeping in idleness.

The Comet Mine at Dundas is still turning out ore for the smelters. There has been considerable improvement in the deeper levels lately. The heavy body of water this company have to contend with is their principal drawback. A tramway is in course of construction from the Brewery Junction to the old Melbourne Proprietary. When completed, it will allow several parties to work to advantage.

The Mount Reid Mine starts sending ore to the smelters at the end of this month.

The Hercules Mine is opening up well. This company is in a position to turn out large quantities of ore whenever it feels disposed to do so.

There are several other mines on the Mount busy prospecting, and with fair prospects.

On the Curtin and Davis Hill a number of miners are working to advantage on the tribute system.

The Fahl Ore group is deserving of a more progressive policy than what it is receiving.

At the Colebrook the diamond-drill is still at work proving the extensive ore-body there. A few months more ought to see this company in touch with the Emu Bay Railway.

At the Rosebery, the Tasmanian Copper is still idle, as the manager has not returned from London.

The Mount Black Proprietary has opened up a good lode, and the manager is now busy erecting a dressing-mill, to be driven by water-power, for treating the ore. This will probably be at work in September.

There are several miners on the hill prospecting, with very fair prospects of success.

The high price of tin has caused attention to be again drawn to Mount Heemskirk and the Stanley River. Several parties are busy at both places.

The Red Hills Mine is opening up well, especially the northern portion of the property, where an extensive body of high-grade copper ore is being exposed. A tram from Argenton round the south side of Mount Dundas would start a number of mines going in this direction.

The new fields at Mounts Jukes and Darwin are opening up with most encouraging prospects. When the North Lyell Railway is completed to Jukes we may look forward to quite a large mining population settling in the district.

In conclusion, I would state that the mining industry of the West Coast never looked brighter than it does at present.

Mr. Inspector GRIFFIN (stationed at Gladstone) reports :—

I have the honour to submit my annual report as Inspector of Mines for the year ending 30th June, 1899.

Before commencing this report I desire to place on record my deep sense of regret at the death of the late Government Geologist and Chief Inspector of Mines, Mr. J. Harcourt Smith, which took place in June last, and by which we have been deprived of the valuable supervision of a chief whose kindness and courtesy has at all times been fully appreciated by the officers of the Department.

Mines Inspected.—The whole of the mines in the Eastern and North-Eastern Districts have been inspected four times at regular quarterly intervals during the year. The mines at Beaconsfield and Lefroy were also visited and inspected by me once, in June last, during the temporary absence of the Chief Inspector of Mines.

Accidents.—The following is a list of all persons either killed or injured in the mines of the Colony during the past year :—10 men (nine Europeans and one Chinese) were killed, and 36 Europeans and one Chinese were more or less seriously injured; total, 47, as against 46, of which 13 were fatal, for the previous year. The causes of the accidents were as follow :—

Falls of Rock.—Eight accidents, two fatal and six not fatal, happened through falls of rock in open cut workings. Of the men killed—

James Rogers was employed underhand stoping on a lode in open cut at the Appalachian Tin Mine, and on endeavouring to recover a head board so as to replace a stull piece knocked out by a previous explosion, he incautiously ventured into the cutting and was caught by a large piece of rock that slipped down from the side, his chest, arm, and leg being badly crushed, causing death 36 hours after the accident.

James Robertson was working in open cut at Mount Lyell, when a small piece of rock struck him on the spine. He died the following day of paralysis. Verdict, accidental.

Frank Jarvis received concussion of the spine and was insensible for several hours, through being caught by a fall of rock while working in No. 1 adit at the Mangana Gold Reefs Mine. Jarvis was one of a party of contractors who were in the habit of working too far without timbering up, and was only a short time prior to this accident cautioned by the Inspector to discontinue such a dangerous practice. He is now all right. This accident was not reported by the manager of the mine, nor was it discovered to have taken place by the Inspector until the limit of time for taking legal proceedings had expired.

A. M'Guiness received a compound fracture of the leg by a fall of rock while working in an open cut at Strong's Rush, Pieman.

Wm. Delaney had his leg and arm broken whilst engaged baring down loose rock in the open cut at Mount Lyell Mine.

H. Knight had his leg broken whilst engaged in baring down loose rock at the Mount Lyell flux quarries.

C. Scott, New Silver Crown Mine, Zeehan. Received scalp wound ; not serious.

J. Ward, while working from the backs at the Golden Gate Mine, had one of his legs caught and slightly injured by a fall or slip of rock from the footwall.

Falls of Earth.—Three accidents from this cause—one European and one Chinese killed, and one Chinese injured. Of the men killed—

George Darcey (single) met his death by a fall of *debris* from a greasy head, whilst working in a stope at the Argent Company's Mine at Zeehan. (The information to hand with reference to this accident is of a very meagre nature.)

Wang Ah Chung, a Chinaman, working alone on his (miner's right) claim at South Mount Cameron, ventured too near the face, nine feet in height, on which the nozzle was playing, and was caught and instantly killed by a heavy fall of earth and cement.

Ah Foon, a Chinaman, working with his mates in a tin face at the Weld Tin Mine, Moorina, had his leg broken by a small fall of earth from the face.

Fall of Debris.—Two accidents.

James Hammersly had his leg and arm broken by a fall of *debris* from the face of a drive in the Oceana Mine, Zeehan.

John Rundle, Silver Queen Mine, was working in a shallow open cut when about a ton of *debris* fell from side and smashed his head, which proved fatal.

Falls of Stone.—Three men injured, but not seriously.

John G. Johnson, whilst trucking at the Mount Bischoff Company's Mine, got his hand jammed by a piece of stone falling from off the truck.

George Smith received a severe blow on the neck and shoulder from a piece of stone that fell from an over-filled bucket he was sending up from shaft-sinking work at the Salmon Gold Syndicate's Mine, Mathinna.

James Smith had his leg hurt by a stone rolling from a heap in the Rex Hill Tin Mine, Ben Lomond.

Fall of Timber.—Two men injured.

H. Marsden was struck on the back and slightly injured by a piece of timber that was being lowered to a level in the Tasmania Gold Mine, Beaconsfield.

R. Irving, Mt. Lyell Co., was putting in timber in a stope, when the timber fell and broke his arm.

Falls down Shaft.—Three men severely injured at Mount Lyell Company's mine.

William Blaney slipped into shaft, and fell 75 feet, striking a man named Mulloy who was at work sinking at the bottom. Blaney received a scalp wound, and had his collar-bone broken. Mulloy had his collar-bone broken.

C. Nicholas left gate of shaft open, and walked in. He received a severe shaking.

Fall of Cage.—At the Oonah Silver Mine, Zeehan, the cage got away with four men, named J. Mancey, D. Toomey, J. Macnamara, and T. Polan, in it, through the driver not putting the catch which holds the clutch of the loose drum in proper position. By the time he got his foot on the brake the speed was such that he could not hold the cage, and it fell about 35 feet. Two of the men in the cage had to be removed to the hospital. One had a rather bad scalp wound. Both were reported to be out of danger on the day following the accident. The question of carelessness on the part of Driver M'Arthur, who acknowledged that he could not have put the catch in properly, has been referred to Mr. E. S. Ross, Chief Inspector of Machinery.

Blasting Explosions.—Eight men injured (one fatally) through these causes.

Thomas Statton and Rupert Vaughan, working underground at the Western Silver Mine—Statton, whilst working out the face, must have touched an unexploded charge—probably a miss-fire from the previous charges—when an explosion followed. Statton was very badly burned and cut about, and died seven days after the accident. Vaughan was badly burned about the face, and lost the use of one eye.

At the Mount Zeehan Silver Lead Mines, Wm. Jones received compound fracture of the arm when returning to a supposed miss-fire.

John Rafferty, employed as "powder-monkey" at the Mount Lyell M. & R. Co.'s mine, was forcing a charge of rackarock into a rugged hole, when the charge exploded. He received burns on the hand; not serious.

At the Mount Bischoff Tin Mine, — Palmer waited only 15 minutes before returning to a supposed miss-fire, an explosion took place, and he was injured. A telegram received from the general manager of the mine four days after the accident occurred reads: "Palmer very low yesterday, but much better to-day. Doctor now hopes to pull him through." The information received in connection with the accident is meagre. Nature of injuries not given. Palmer's Christian name not given.

J. Simons, hammer and drill man at the Anchor Tin Mine, jumped a deep hole in the rock and bulled it out in the usual way with a plug of gelignite, but as the space thus produced was not large enough for the powder charge, he primed another plug of gelignite, and was about to drop this down the hole on to a couple of handfuls of powder, when a spark from the lighted fuse must have exploded the powder. Simons had his face badly burned.

T. Mitchell, Mount Lyell, was charging a hole, when an explosion occurred, resulting in a serious scalp wound.

G. Hudson, Silver Queen Mine, returned to a supposed miss-fire, when charge exploded. He received severe scalp wound and lost the sight of both eyes.

Boiler Explosion.—Two men killed, three seriously injured, at New Mount Zeehan Silver Mining Co.

Mathew Hoskins, aged 34, manager, married, and Edward Bowden, aged 42, widower, scalded to death. Thomas Grubb, A. Stokell, and William Richardson, badly scalded. It appears the manager and engine-driver attempted to adjust the pin of the safety-valve, which in some way got out of place, and called the other three men to assist. There was something like 40 lb. steam pressure on at the time. A bar was applied to get leverage on to the pin, and this slipping from its fulcrum—probably forced off by the sudden stoppage of the escaping steam—the valve was blown out, and the five men at once enveloped in scalding steam, with the result already stated.

Breaking of a chain.—John Ritz and Jas. Conole were engaged getting some machinery up the Hercules tramway, when a link of the chain broke. Ritz had his lip cut, and Conole received severe cuts about the head.

Entering a cage in motion.—At Western Silver Mine, Thomas James Phelan got off a cage, and in attempting to get on again was thrown into the shaft and instantly killed. From evidence at the inquest it appears that Phelan got off at the wrong level, and on finding his mistake attempted to re-enter the cage, which, the platman says, had started to go down. The platman prevented him, and knocked 1 to stop the cage. Phelan then attempted to get in, but the cage immediately rose and he was caught against the cap of the opening-set and fell down the shaft. The engine-driver stated that the cage was at rest when he received the signal of 1 knock, which he interpreted to mean "Hoist empty cage." The jury were of the opinion that the signalling code should be amended.

Machinery in motion.—Two men seriously injured, and one not seriously.

Allen Bird, aged 24, married, employed at the Tasmanian Gold Mining Company's battery, lost an arm through being caught in a belt used for driving a grindstone. The belt was twisted round the countershaft of the rock-breaker, and the injured man, whose duty it was to oil the shaft, had been warned against going near it until the breaker was stopped.

Wm. Godwin had his thumb completely severed by being caught between the frame and driving-wheel of the battery at the Australian Tin Mine (Lottah) while cleaning the machinery in motion. He was not required to do this work, and had only himself to blame for the accident.

William M'Neice, aged 13, employed at the Western Mine, Zeehan, came in contact with a belt in the mill, and received a cut on the head.

Miscellaneous.—John Fletcher, South Lyell Company, had his arm broken through a drill falling down the shaft.

G. Grubb, Silver Crown Mine, had his leg broken through a fall from a wood-truck.

Percy Williams, Mount Lyell Mine, received fatal injuries through being run over by a wagon in open cut.

The majority of the foregoing accidents were caused through carelessness or want of caution on the part of the person injured; some few were unavoidable. One unfortunate accident, causing the death of Thomas J. Phelan, appears to have been caused through confusion of signals. Following a recommendation of the jury in this case, several members of the Mining Managers' Association, as well as the President and Secretary of the Australian Miners' Association, and Mr. J. Harrison, Inspector of Mines, joined in framing an entirely new code of signals, which it is sought to have made universal for the whole Colony. Copies of this new code have been distributed amongst the mining managers of the northern and eastern districts, who, however, do not appear willing to adopt it, as it is considered to be too complicated to be applied to most mines. It is therefore not likely to come into general use in the mines of the Colony. There can be no doubt as to the desirableness of a complete code of signals being made universal for the mines of the Colony if such a thing can be accomplished without, as it were, compelling owners or managers to use a code, however perfect it may appear to be, that they protest against it as being unsuited to their respective mines.

The Regulations and General Rules, as per Part IV. of the Mining Act of 1893, have on the whole been fairly well complied with. There is less fault to be found with the methods of working, and explosives are being handled and stored with more care than hitherto. There is, however, one thing that demands serious consideration, as affecting the health, and, in many cases with serious consequences, the lives of the men employed in these mines: that is ventilation. The majority of the mines in these northern and eastern districts are ventilated by natural means, which is fairly satisfactory in the case of mines worked by adit levels, but not so in the shaft mines, where there is, perhaps, no second shaft to be used as an "upcast," and give better circulation. Natural ventilation at best has its drawbacks, being so easily affected by atmospheric influences. In cold weather the circulation is, perhaps, all that can be desired, but in hot, muggy, summer weather it is the reverse. Artificial ventilation is produced in the coal mines of Mount Nicholas by means of furnace "upcast" shafts, using the main working tunnel at each mine for "downcast," or inlet of cold air. This is a satisfactory way of ventilating, if only reasonable attention be given to bratticing, regulating doors, and furnace. In several of the deep quartz mines compressed air is used to assist circulation, but as this generally comes from the exhaust of the rock drill machine its good effects are only felt locally, the noxious gases being driven out of one place to settle in another, probably—if it be a heavy gas such as carbonic acid—to settle in another along the working roads or levels. The best known mechanical contrivance for the ventilation of deep mines is the blower or fan, which, when used as an exhaust at the "upcast" shaft, is found to work well and give good results. Of course, the introduction of a ventilating machine means increased expenditure in the equipment of a mine, and owners and managers, as a rule, try to do without this extra cost; but as good ventilation in a mine means a far greater amount of labour being performed by the men employed in a given time, not to speak of the losses of having the working of certain levels and stopes stopped altogether at different times owing to some sudden change of the atmosphere, and also the delays caused through waiting for the smoke to clear off after shots are fired, it is, after all, doubtful economy for owners to work their mines without being properly ventilated. Section 102, Sub-section 1., under "General Rules," in our Mining Act, says:—"An adequate amount of ventilation shall be constantly produced in every mine to such an extent that the shafts, winzes, sumps, levels, stables, &c., shall be in a sufficient state of ventilation for working and passing therein." In very many of our mines the requirements of this Section of the Act are not complied with, not but that managers are always, or nearly always, willing to remedy—so far as lies in their power—any defect complained of by the inspector; but if owners will not provide the necessary means to thoroughly equip their respective mines, the manager is powerless to do what is required. The authority of the inspector is often required to assist managers in cases of this kind. There can be no doubt of the urgent necessity for improved ventilation in very many of our mines, especially at Lefroy and Beaconsfield, where many of the lodes give off large quantities of carbonic acid gas in addition to that produced by respiration and the burning of lights, thus endangering the health and lives of the men required to work in such places. The baneful effects of insufficient ventilation for the miners of the Colony is only too apparent. I therefore respectfully recommend that the "adequate amount of ventilation" required by the Act be insisted upon, irrespective of what the cost of producing such may be to any mineowner.

Complaints.—Only one complaint was received, and as this was not of a serious nature, it was easily disposed of. As a rule, the men employed at the different mines show an inclination to avoid anything in the way of a complaint to the inspector.

Ropes, cages, and safety appliances have been practically tested at regular intervals, and one of the former condemned. Safety appliances were found to act well.

I am glad to report a more prosperous and progressive state of things in connection with the tin-mining industry in this part of the Colony. The great rise in the price of this metal which has taken place within the past year has enabled the owners of many old mines that have been barely able to keep going through the time of depression, to work at a profit, and also give employment to a greater number of men. Very many old claims that had been idle for years have been reopened, and portions of same considered not payable in the past are now worked at a profit. Of the big mines working, the Briseis is perhaps the largest producer at present, and the rich and apparently extensive deposit of drift and gravel now being operated on should gladden the hearts of shareholders.

At the Anchor mine the work of development has been prosecuted with energy. Just a year ago this mine, which cost so many thousands of pounds to equip with the most modern tin-dressing machinery, was shut down, marked not payable. Some two months later it was reopened, the management this time being in the hands of Mr. R. Mitchell, than whom no better tin ore-dresser is to be found in these colonies. No. 2 50-head battery—erected but not worked by the previous manager—has been overhauled, readjusted, and set going, thus completing the whole plant of 100 heads. The rock has been tested by boring with diamond drill at different places, and although the prospects obtained were not any better than the average from the working face, still sufficient has been done to prove the existence of a great extent of the tin-bearing quartz porphyry. In addition to this, an adit has been driven in rock from the battery tramway level, about 25 feet below the floor of the main face. The stone obtained from this is richer in tin than that of the

main working. The quantity of tin ore obtained from each ton of stone crushed is 9 lbs., equal to four-tenths ($\frac{4}{10}$) of one per cent., which—low average though it be—is sufficient at the present high price of the metal, combined with the small cost of treating the stuff, to give handsome returns. Not more than 75 heads of stampers have been in work up to the present. Each of those is capable of crushing three tons of stone in the 24 hours. The stone is crushed, and the disintegrated stuff passed over classifiers, jiggers, and frue vanners, and tin ore dressed up to 70 per cent. obtained without re-handling from the time it goes into the battery hopper.

Another trial is being given the Liberator Mine; and it is now hoped, with the enhanced price of tin, that this mine will be made to pay.

The Cambria, a couple of miles further west, is being opened up, and a tramway about 4 miles in length is being constructed to connect the mine with the Liberator battery.

Mr. Alfred Deedes, chairman of the Anchor board of directors, is responsible for the opening up of these outside mines; and, if we may judge from the enterprise and pluck shown by this gentleman and his co-directors in sticking to the Anchor Mine when it was thought to be a failure, it is only fair to assume that the other mines of which they are the owners are at all events reasonably good shows, and that capital for their development will be provided and judiciously expended. The Anchor Company are now about to commence the construction of a water-race to bring water from the Columbia Falls, George's River, on to their mine. The erection of tin-smelting works by this Company is also under consideration.

The Australian Tin Mine battery has been crushing stone from the Don section for the past four months. The stone is being hauled to the battery over an inclined tram 30 chains in length, the ascent from mine to mill being about 100 feet. The stone being treated is said to go one per cent. of tin.

A new discovery of alluvial tin has been made on the shore of George's Bay, about 4 miles south-east by road from St. Helen's. Not much in the way of development has been done so far.

Coal Mines.—New works have been opened up at both collieries during the past year, and at present the Cornwall Mine is working on a good six-ft. seam, in which several down-throw faults had to be passed at the opening up. The seam is now worked in more settled country. A second seam—probably a continuation of the old 4-ft. seam further east—is being opened immediately above the 6-ft. already referred to. The whole of the works at this mine are in a satisfactory condition.

At the Mt. Nicholas Mine the upper 6-ft. seam, worked many years ago, is being reopened at a point east of the old workings. I understand from the manager that the intention is to develop, and then carry on the whole of the workings on this seam. The old workings are in a very bad state of repair, and it is only by frequent warnings and threats of penalties that the Inspector is enabled to get the proper timbering to secure the mine put in. Indifferent ventilation is another cause of complaint. Altogether the working of this mine is most unsatisfactory from an Inspector's point of view.

Ben Lomond.—The Rex Hill Tin Mine commenced crushing at their 10-head battery a short time ago. The stone is obtained from the flow and partly from the sides of the old chamber. The works are being carried on with due regard to the safety of the men employed.

At Mangana a fresh start has been made at the Mangana Gold Reef (late Sovereign) Mine. New poppet-heads are erected, and the old shaft is to be sunk to a further depth of 200 feet, where it is hoped to again pick up the shoot of gold met with in the upper adit levels.

Salmon Gold Syndicate's Mine (Miami).—Good progress is being made here with opening up of the mine. The shaft is down 400 feet, or 200 feet below No. 1 adit level. The lode east of No. 3 level has opened out to width of seven feet a solid body of stone. Found the works in good order, regulations being well complied with.

Mathinna.—Very little is being done at this place outside the New Golden Gate Mine; the workings of this latter is satisfactory. In the early part of the year the stopes at this mine were being filled with sand from the cyanide vats, which had the effect of vitiating the ventilation of the mine to a certain extent. Complaints were received in an indirect way, but the men, when questioned directly, declined to say that the bad ventilation was caused by the filling in of the cyanide sand. Eventually, however, when an appeal was made to the manager, the filling of the stopes with cyanide sand was discontinued forthwith.

Duirng the year the new cyanide plant, comprising four 100-ton vats, has been completed, and is now operating on a large heap of tailings, estimated to contain 100,000 tons, which gives an assay of 2 dwts. 15 grs. of gold to the ton. About 80 per cent. of the gold contents are recovered by the cyaniding process. The cost of treatment by the old plant, which is still in use treating the slimes from the battery, or, more properly, from the vanner concentrating plant, was 2*s.* 3½*d.* per ton, which included cyanide, zinc, labour, acids, mint charges, coke, &c. The assay value of the sand before treatment was 8*s.* 6*d.* per ton; after treatment, 1*s.* 5*d.*; extraction value, 7*s.* 1*d.*; thus leaving a profit of 4*s.* 9½*d.* per ton. A Rand Drill Co.'s air compressor plant, equal to 12 drills, has been added to the equipment of the mine, at a cost of £1000.

Messrs. Doyle and Bairstow, late of Charters Towers, Queensland, have erected a cyanide plant equal to treating 100 tons of sand per week, and are treating the sand from the old City of Hobart battery. They appear to be very well satisfied with results so far.

Marshall and Terry's Gold Sections on the head waters of the Scamander River, about 12 miles N.E. of Mathinna. There are several lodes traversing these sections, all of which are said to be rich in gold. A good deal of prospecting has been done, and a battery (10 heads) is being erected.

Several mines—the October, Mabel, and Record, north of Mathinna, all in full swing a year ago—are now shut down. Hickson's Gold Mine is still working, and their chances of success are good if they once get a plant equal to coping with the water, which is very heavy.

Mount Victoria.—The Ringarooma Gold Mining Company has been doing a good deal of preparatory work during the year. A 12-head battery has been erected at the New River freehold property, also six heads of stamps added to the Ringarooma battery. Preparations are being made at this latter place for the erection of a powerful electric plant, to be used for the purpose of pumping and winding, in the mine a

little way off. The electric power is to be transmitted by cable from the dynamo to a large chamber underground about 1100 feet from the entrance to the main adit. In this chamber, which is 48 feet in length by a width of 19 feet, height from 11 feet at lowest part to 24 feet at end where shaft is being sunk, the winding and pumping machinery will be placed. When this plant is finished it will afford a means of sinking on the Gumsucker lode, from which such good results have already been obtained. The Pennefather P.A. Mine has been refloated under the name of the Central Ringarooma. Prospecting is being carried on under the supervision of Mr. Wm. Brown, manager of the Ringarooma Mine. Of the outside shows at Alberton I cannot say much, as I have but few opportunities of judging of their system of working. They are generally about to commence work, or have just ceased operations, when I visit the locality.

Warrentinna.—Mining at this place is at a very low ebb. The East Volunteer has been shut down for several months past. The Coronella Extended, now known as Bayley's Lease, are debarred from getting capital to develop their mine through pending litigation. The Derby Mine still keeps a few men on, but results are not satisfactory.

REPORTS OF THE COMMISSIONERS.

Mr. Commissioner GLOVER reports :—

Though the experiences of the past year do not disclose any final result in mining operations on the Northern Goldfields, they present circumstances which justify expectations of such results, of a highly satisfactory nature, in the near future. In my last annual report I mentioned as a hopeful circumstance that efforts were then in progress in England to induce the investment of capital in developing the sections on the S.E. and N.W. of the Tasmania Company's ground at Beaconsfield, as, without the aid of outside capital, effective development of mines on these fields was an utter impossibility. I also alluded to the somewhat remarkable circumstance that, although the great extent, depth, and continual productiveness of the Tasmania Mine had been positively proved, capitalists had never been tempted into the enterprise of locating the same lodes outside that Company's boundaries. I have now the satisfaction to report that both of these desiderata are about to be realised. Although the negotiations for capital then pending in England fell through, Victorian aid has recently been secured for the effectual development of eight sections on the western side of the great mine. A strong association has been formed in Victoria to intercept the western continuation of the Tasmania reef. This event is no longer in the realm of uncertainty, mining operations being in full activity, and machinery to cope with the inevitable water has arrived from Melbourne. Fair grounds are thus afforded for the hope that the mysterious and erratic reef, which has for some 20 years baffled the many futile attempts for its discovery, will at length become the scene of mining industry, outside the Tasmania Company's boundaries. Another subject for congratulation consists in a further acquisition of Victorian aid in an entirely new branch of mining enterprise, namely, the utilisation of the extensive deposits of asbestos in the vicinity of Beaconsfield. A strong company has been formed in Victoria for the said purpose, called the "Australasian Asbestos Company." The quality of the mineral to be operated upon has been pronounced by recognised experts in that class of industry to be superior to that of most of what is already known and utilised in other parts of the world. Considering the many and important uses for which, within only the last few years, asbestos has been found to be adapted, there can be little doubt of the importance of the enterprise. The celebrated Tasmania Mine continues to maintain its great contribution to the mineral yield of the country. There are eight other mining operations in more or less activity, but they are still in the prospecting stage, at various depths from the surface, within that of 400 feet. The quantity of gold produced from Beaconsfield for the past twelve months was 28,835 ounces, value £108,371. The average number of men employed in mining work at present is 616.

All hopes and expectations for the future of Lefroy are now centred in the efforts of two mines, the Volunteer and the New Pinafore, whose deep-sinking operations more than 12 months ago had reached depths of 1300 feet and 1250 feet respectively, but the work of which has since been devoted to prospecting at those levels in the hope of finding sufficient gold to supplement the contributions of shareholders, upon which alone the former depends for the continued prosecution of its enterprise, the working expenses being £500 per month. The expenditure of the latter is aided to some extent by the gold extracted by the cyanide process from the "tailings" accumulated for many years. Should the operations of these two mines succeed in revealing gold at greater depths in payable quantity, as expected by analogy of similar localities in Australia, it would inevitably cause work to be resumed in the six other mines at Lefroy, which were once so prolific to a depth of about 400 feet, when the yield ceased, as it did also in the case of the two mines in question. These two mines alone, when in their productive state, yielded, for the year 1894, 24,518 ounces of gold, value £96,488. It is much to be regretted that a goldfield with the possibilities of Lefroy should remain unproductive for the want of pecuniary means for its development. Within the last few days a promising report has been made by a prospecting company between the "Pinafore" and "Chums" reefs; a crushing of 42 tons at their claim yielded 98 ounces of gold. There are at present 133 men employed in mining work on this field.

The worked-out surface alluvial goldfield of Lisle still holds out sufficient inducement to some 40 or 50 men, being principally persons who have settled on small agricultural holdings in the vicinity, and supplement their means by gold-digging on spots formerly imperfectly worked and abandoned. But the new departure in mining operations, recently introduced from New Zealand, by dredging, not only rivers, but on suitably humid localities on land, is engaging the attention of several persons, and at present applications have

n made for over 100 acres for that purpose at Lisle. At Golconda, Denison, &c., prospecting work is vely proceeding, but nothing has transpired worth reporting.

At Middlesex Plains, including Bell Mount, Forth, &c., many prospectors are engaged in exploring region. There are at present only four settled mining operations, but the only one of these demanding cial notice is that known as "Shepherd and Murphy's" claim. Although the mine contains several ociated metals, its present principal yield is tin and bismuth. Some 5000 tons of ore are estimated to n sight, and 600 tons of ore have been mined, and ready to be dealt with; and about 300 tons have n sent away by means of pack horses. But little or no progress can be made until the great difficulties transit can be overcome by means of a road.

Mr. Commissioner O'Reilly reports :—

I have the honour to submit my Report for the year ending 30th June, 1899, upon the state of mining he North-Eastern Mining District.

Gold.—At Mount Victoria, during the past year, mining operations have been carried on in a steady satisfactory manner on several of the claims.

A considerable amount of enterprise has been shown by the Ringarooma Gold Mining Company in viding the most modern appliances and requisites for working their mine in a comprehensive and effective nner. Extensive and costly works are now in progress, with the view of thoroughly opening out the ıe, so that it can be worked with economy and successfully. Electrical pumping and winding plant are ut being erected for this purpose. There will be a fifteen-head battery (water-power) in this claim ıpleted in a short time. This company also holds at New River, a few miles distant from the above m, three hundred acres of freehold land, upon which gold reefs of a very promising character have n found, and, so far as tested, have proved payable. A ten-head battery is now being erected on this m, and the prospects of this mine are considered very favourable. The capital of this company appears ɔe economically and judiciously expended, under careful and able management, on the works of their ıes.

Several other claims in this locality are making satisfactory progress, and, on the whole, the prospects ɔear very bright.

Alluvial gold is found in payable quantities on private property at New River, four men being ployed.

At Warrentinna, mining operations have been very limited, and do not appear to have been carried in a skilful or satisfactory manner, resulting in disappointment and loss of a considerable amount of ital. A moderate amount of capital, expended under capable and judicious management, in testing the fs by deep-sinking, would, it is generally believed, prove highly remunerative. Until a radical change the present system of mining is brought about I cannot look hopefully for any improvement from the sent depressed state this mining field now labours under.

Nothing has been done at Waterhouse or Lyndhurst during the past year in the way of mining rations. Several sections have been applied for under lease, and it is to be hoped that mining operations l be commenced during the coming year. I have no doubt that a moderate amount of capital expended iciously here would result satisfactorily.

The Portland Company's Mine, situate near Gladstone, has been closed down for some time through ıt of capital to develop it. Although the lodes on this claim are narrow, they have been proved to be hly payable if sufficient capital were provided to mine and treat them. There is a considerable area of iferous land in this locality, which would warrant expenditure of capital in prospecting it.

On the whole, notwithstanding the drawbacks referred to, I look forward to substantial progress being de in the state of gold-mining in this district during the coming year, especially at Mount Victoria, ɛre the yields from the claims there will be largely increased.

Alluvial gold is found mixed in small quantities with alluvial tin ore on several of the tin claims, and ns an important factor in producing profitable returns, but it is difficult to estimate the quantity thus n.

Quartz crushed	2397 tons
Gold won	2273 ounces
Average number of men employed.....	90

Tin.—In the Ringarooma locality, tin-mining has during the past year been carried on to a very ited extent, and the returns of yields but small.

Considerable enterprise has been shown in opening up some claims at Mount Maurice, but so far returns have not proved satisfactory.

At Branxholm much mining activity is shown, a large number of claims being at work in the locality Ruby Flat, and the yields are considered very satisfactory. The Arba Tin Mining Company—now orporated with the late Ormuz Tin Mining Company—whose claim, situate on private property, oins that of the former company, are now taking vigorous measures to properly equip their mine, and ɛe in good repair, at considerable cost, their water-races. I understand that it is proposed to work this ıe upon a large scale, and this will infuse new life into the mining industry in this locality.

At Derby and Brothers' Home, the principal claims there have been continuously worked, the average nber of men being employed, and prospects are considered to indicate increased outputs during the ning year. The carrying out of large and costly waterworks from the Upper Ringarooma River is ler consideration by the Briseis, and also the New Brothers' Home No. 1 Company (surveys being de), to provide an adequate supply of water for mining their claims on much more extensive scales than etofore. The latter company is now engaged in removing the heavy overlay of basalt from over the ı tin deposit, and consequently do not raise much tin. The Briseis Company's claim looks exceedingly l, and is under careful and able management. Last month's yield of tin ore amounted to 30 tons, and sent prospects indicate a continuance. The face, where now mined, appears very rich in tin ore, and deposit or wash has not yet been bottomed there. I understand that a Melbourne syndicate have the

option of floating this mine, under certain conditions, in London, the terms being £150,000 to the shareholders in the company, and £40,000 to be paid to the working capital of the mine, the present shareholders retaining one-fourth interest in the mine. The yields from the Krushka Brothers' Mine continue satisfactory, as also from the Brothers' Home Extended claim, which latter is mined very successfully by a co-operative party of miners.

The prospects of the Moorina locality have very materially improved of late. The local claims are in full work, and yielding fair returns. New claims are being taken up, and capital proposed to be invested, which will tend to remove the depression experienced in this place of late years.

The Pioneer Tin Mining Company's claim at Bradshaw's Creek has been practically shut down for a considerable time. This is caused, I understand, through defective supply of water. A large outlay is required to provide an adequate supply, of necessity, from a considerable distance. The tin deposit in the workings of this mine have not yet been bottomed, and prospecting operations by boring-rods are now being carried on to test the value of deep deposits. This mine should yield very profitable returns if sufficient capital were supplied to carry out mining operations on an extensive and economical scale, even at the present levels of previous mining.

At Wyniford River and South Mount Cameron a large number of small claims are being mined, principally under miners' rights.

The Gladstone and Mount Cameron localities have largely felt the depression and dry seasons of the last few years. Many miners from here removed to the West Coast and other mining districts to obtain more remunerative employment. This depression has not yet been removed, notwithstanding the enhanced value of tin. I fear it will take some time yet before an increased mining population becomes settled here. There is a considerable extent of mineral-bearing land, but the absence of water supply, beyond that obtained from the Government water-race, and also from conservation dams, renders it impossible to mine the high-level lands on the western side of the Ringarooma River. There are here also considerable areas of river and swamp stanniferous flats well worth the attention of capitalists for dredging purposes.

Tin lodes have been found in the Gladstone locality, on the former Esk claim, also on the Cascade Range and near Moorina, the prospects of which are considered very good.

The success attending mining operations by dredging in New Zealand and Victoria of late years has caused much attention to be given to this mode of mining river-beds and flats in this district by this process for tin ore profitably.

The Tasmanian Tin Dredging Company hold several river-bed sections under lease on the Ringarooma River at Derby, and have there constructed a powerful and well-equipped dredge. Dredging operations will be commenced in a short time in the river, near the outlet of the tail-races of the principal mines there. It is considered that there is a large quantity of tin deposited in the river-bed from the mines, and should the appliances on the dredge prove suitable for saving it, the enterprise of this company will, I have no doubt, prove remunerative, and lead to a very large extent of the bed of this river being leased for dredging purposes.

At Corduroy Creek, the Ringarooma Dredging Company holds a maximum area of land under a prospector's licence, and, having thoroughly prospected the ground by boring operations—some eighteen holes having been put down under the supervision of Mr. Joseph Will—have proved the land to be payable, all the bores showing tin ore mixed with a small quantity of gold. These satisfactory prospects have led the company to order from Messrs. Bogle & Clarke, of Launceston, a steam dredge, at a cost of £2500, which is expected to be completed, and at work on the claim, in the course of four months. Mr. Henry Carlin, late manager of the Esk claim at Gladstone, has been appointed manager, and I have no doubt that under his careful and able management this enterprise will succeed. All the conditions of the place are considered very favourable for carrying on this particular class of mining. The success of this enterprise will have a very beneficial effect upon the future of this district.

In the aggregate a considerable area of ground is held under extended prospecting claims for deep leads, principally upon river flats and swamps. This latter description of land can only be profitably mined by a cheap system, such as is provided by the use of dredging plant, and the greater part of the land thus held will, if proved payable, be mined by this mode. These prospecting claims for dredging purposes are necessarily large, as capitalists who invest in mining undertakings require a considerable area of ground to operate upon, and unless this can be secured they will not invest. There is not any likelihood of such land being mined in small areas, as the cost of providing a dredge at £2500 would generally be beyond the means of those who mine small claims. For this latter reason also, the granting of extended areas has not in any way interfered with the mining requirements of the small claim-holders, and no complaints have been made to me by any of them as regards their being deprived of land required by them for mining purposes by the granting of these claims. On the whole, I look forward with confidence to the introduction of a considerable amount of capital into this mining district for the development of dredging claims on river flats and swamps, through the granting of these extended areas, that would not, most likely, be so invested if these areas had not been granted and prospected. I regret to say there is not sufficient local capital for this purpose, and the advancement of the place, in the way of mining, depends very largely on the introduction of outside or foreign capital. So far, very satisfactory prospects have been obtained on several of such claims, and I look forward to a large extent of the lands on these areas being applied for under lease in the course of a few months.

About forty leasehold claims, and seventy miners' rights claims have been mined during the past year, the average number of men employed being 183 Europeons and 195 Chinese.

The total output of tin ore from this district for the year ending 30 June, 1899, amounts to 887 tons, being an increase of 118 tons 5 cwts. over the previous year's yield.

Taking all the adverse circumstances connected with carrying on mining, shortness of water supply, &c., into consideration, this yield is very satisfactory.

On the whole, the future outlook for tin-mining in this district appears very promising and encouraging, and is likely to be profitably carried on for many years to come.

the shaft is 100 feet lower than in the Western, payable ore has been found 100 feet lower than in the Western Mine. During the year the mine has been equipped with new assay office and plant, an air compressor and five rock drills, an electric light plant and 140 lights, general workshops, engine, lathe and fittings, and blacksmiths' shops with two forges. In March last the company obtained the Tasmanian Crown property, and are now carrying on mining there. 33 chains of tramway have been laid, connecting the Old Despatch Mine with the Montana main workings, and operations there will be commenced in another month.

At the Oonah Mine a contract is being let to sink the main shaft another 100 feet, which will give a total depth of 425 feet.

The Silver Queen Company have confined their operations chiefly to the No. 4 and No. 5 mines. The greatest depth reached is 310 feet. About 80 men on an average are employed by the company. Tributing is carried on on nearly all the company's sections, an average of about 55 men being thus employed.

The Mount Zeehan Tasmania Mine has reached the dividend-paying stage. A dividend of 1*s.* per share on its preferential shares was paid in December last, equal to £2150. The company employs about 56 men, and another 50 are tributing on its various sections.

On the Comstock Mine there is a large ore formation, some 26 feet wide, carrying bands of zinc blende, assaying 46 per cent. of zinc. A market for this has been found with the Tasmania Smelting Company, who purchase it for export.

The Colonel North Company has acquired the Grubb's Mine, buildings, and tramway. The tramway is being taken up and relaid to a 2-ft. gauge.

Work has ceased at the Oceana Mine. A subsidence occurred of the ground round the main shaft, rendering it unsafe. It is doubtful when operations will be resumed.

With the exception of the Comet, not much is being done in the vicinity of Dundas. That company is delivering about 250 tons of ore per month to the smelter.

The Great South Comet Mine is being worked by tribute, and a tram is being put in, to connect with the Adelaide Company's tram.

The self-acting tramway from the Hercules Mine to Deep Lead has been completed, and bins, with a capacity of 250 to 300 tons, are now being erected, to receive the ore and load it on to the North-East Dundas Tramway's trucks. Developmental work is going on vigorously at the mine, revealing large payable bodies of ore. Exploration seems to show that the deeper the ore bodies are followed the freer they become from zinc.

The Mount Reid Mine has completed connection with the Hercules Tramway, and has sent away 122 tons of ore for experimental treatment: 5 tons to the local smelter, and 117 tons to England, to be treated by the Ellerhausen process. A rock-drilling plant is soon to be erected. Contracts have been made with the Tasmanian Smelting Company to deliver to the smelter 30,000 tons of ore, of which 5000 tons are to be delivered before end of December next.

There are about 40 men employed in the Rosebery district. The Mount Black Proprietary, Mount Black Extended, Mount Black No. 1, North Tasmania Copper, and Berry Consols are the only mines now at work. The Mount Black Proprietary Company has sent away 21 tons of ore for experimental treatment: 5 tons each to Wallaroo, Dapto, and Dry Creek, and 6 tons to Tasmanian Smelting Company. The company intend shortly to erect concentrators, and excavations are now being made for that purpose. The machinery will be driven by compressed air, obtained by water-power. Ample water can be obtained from the Stitt River, so the cost of concentration should be very low.

All the mines above-named are carrying on work vigorously, and in addition there are many others which are rapidly pushing on prospecting and developmental work, and should become large ore-producers in the ensuing year.

About 40 ounces of gold have been won during the year from alluvial workings. There are very few miners working for it at present.

Tin-mining showed signs, three or four months ago, of increasing in importance, but up to the present very little work has been done. Some half-a-dozen miners are working the alluvial deposits about Mount Heemskirk.

A seam of bituminous coal has been recently found near Eden. There has been as yet no time to test its value or quantity. The seam is a foot in thickness on the surface, and the coal is said to burn well and throw out a good heat.

Mr. Commissioner Fowell reports:—

The mines that have come immediately under my notice, as having been actively engaged in work during the past year, are:—

First and foremost, the *Mount Lyell Mining and Railway Company*.—This company have during the last year mined and smelted 210,550 tons of ore.

The average number of men employed during that period has been—

At the reduction works, in all branches	1400
At the mine	422
	1822

During the past year the extension of the company's railway from Teepookana to Strahan has been commenced, and it is expected that train service will be established between Strahan and Queenstown by the end of the year.

An aerial ropeway has been constructed between the mine and the reduction works, and is working very satisfactorily.

A large area has been applied for in the neighbourhood of Mounts Jukes and Darwin.

At Mount Jukes, on the section known as *Harris' Reward*, work has been resumed, but much cannot be done until a good pumping plant is obtained and the country is tried at a depth.

Mount Jukes Proprietary.—Progress is much hindered on this and others in the neighbourhood by the want of a track. The cost of packing provisions is £1 for 50 lbs.

10 men have been continuously at work prospecting on the three sections held by this company.

North Jukes.—Prospecting work done for the last 10 months.

Queen Jukes.—Ditto.

South Jukes.—Work is carried on by a syndicate, and the property is under flotation into a company

3526-93M, Hy. Turner.—Being prospected.

Bean and Allen's.—Intermittent prospecting done, and very rich ore discovered, assaying up to 60 per cent. copper.

At Mount Darwin—the *Prince Darwin*—work has been carried on continuously during the last six months.

On the Darwin Proprietary, and what is known as Dillon's Show, work has been started.

The whole of this country is metalliferous, but the present holders have not enough money to do more than surface prospecting, except in one or two instances.

When the North Lyell Railway is completed this country will be opened up, and there is every prospect of its supporting a large population.

At Mount Huxley one or two men are still making good wages fossicking for gold, and the present holders of gold leases there should take immediate measures to prove their properties. It will require capital to do so, but the indications would certainly warrant it.

I regret to have still to report very little progress made on the gold leases in the neighbourhood of Woody Hill.

The Messrs. Murray Bros. have steadily gone on working, and have altogether crushed about 175 tons of quartz, which yielded 11 dwts. to the ton.

This yield ought to be a sufficient inducement to lead the holders of properties in the neighbourhood to try what they are worth.

There has been very little alluvial mining done. The reason, I believe, is that work has been plentiful, and miners prefer it to fossicking for gold.

I have endeavoured to give you as full an account as possible of the work actually going on at the present time.

Mr. Registrar FIDLER reports:—

I beg leave to report on the mining industry in the Waratah division for the past year. The Mount Bischoff Company has, as usual, maintained its regular output, and is likely to do so for many years to come. Tin has been known to exist at Whyte River for years, and is now being sought after by prospectors. Having myself seen a deal of tin-mining on the North-East Coast, I feel confident that the ground at Whyte River would pay small parties well, after spending a month or two to get the water on. There is nothing there to warrant a company being floated, so far as known at present. In silver ore, I may mention that the Silver Cliff, near Waratah, is shut down, and has been so for some few months.

The Magnet Mine, about 10 miles from Waratah by road, now employs about 50 hands, and the mine looks really splendid; and, no doubt, with proper appliances on the mine for treating the ore, it would pay handsome dividends.

Several sections are held for silver in the vicinity of the Whyte and Heazlewood rivers, but no work is being done on most of them. I have lately seen some specimens of copper ore from a find near the Heazlewood River. It appears to be of good quality, and reported to carry a good percentage of gold. It is known locally as "Binks' Show," and is highly spoken of by those who have seen it.

There is no work being done on the Long Plains at present. At the Specimen Reef they have been doing a little prospecting for some time. The Rocky River Mine has been rather unsettled of late, having changed its mining manager, but is settling down again. The Rio Tinto appears to be hung up, nothing doing there.

On the whole, the mining industry in the district is in a healthy condition, and there appears to be plenty of employment for everyone. There are several good shows, only requiring a little capital and good management to make them pay.

THE MOUNT LYELL MINING AND RAILWAY COMPANY, LIMITED.

Reduction Works, Queenstown, Tasmania,
July 16th, 1899.

DEAR SIR,

I AM just in receipt of your wire respecting the information of our output for the year ending June 30th, 1899.

The work done at the mine is as follows :—

Ore despatched to Reduction Works—	
Excavated in open cut	197,617 tons
Won underground	19,719 „
TOTAL	217,336 tons
Number of feet driven	3013 feet
„ „ sunk	153 „
„ „ risen	24 „
TOTAL	3190 feet
Quantity of overburden removed	288,058 tons
Average number of men employed during the year...	422

The work done at the Reduction Works is as follows :—

Quantity smelted during the year (total ore)	201,550 tons

N.B.—The difference between this and the quantity above reported as produced by the mine, is the amount on hand in bins, unsmelted.

Output in blister copper	6105 tons
Containing copper	6029 „
„ silver	714,578 ozs.
„ gold	24,726 „

N.B.—This production of metals does not take into consideration the quantities contained in middle products in stock, and not worked up at the end of the year.

The last furnace, No. 11, of the entire plant, was blown in on June 29th, 1899.

Average number of men employed at the Reduction Works in all branches 1400

The above figures, of course, relate to the year from July 1st, 1898, to July 1st, 1899.

The figures for the Reduction Works since the inception of smelting operations, in June, 1896, up to July, 1899, are as follows :—

Total ore smelted	406,586 tons
Total production of metals—	
Blister copper	13,119 „
Containing copper	12,961 „
„ silver	1,363,874 ozs.
„ gold	57,467 „

I trust that the above information is what you wanted. If anything else is required, please advise me.

Yours truly,

ROBT. STICHT, *General Manager.*

The Secretary for Mines, Hobart.

TASMANIAN SMELTING COMPANY, LIMITED, ZEEHAN, TASMANIA.

Zeehan, 31st July, 1899.

DEAR SIR,

IN response to the inquiries for information, we respectively submit the following sum of money expended—over £100,000 :—

Cost of construction over £57,000.

Ore purchases over £30,000

Balance went into fluxes and supplies.

The roasters have had a fair trial, and with very good success.

The yield of two and (or) three roasters being 2250 tons calcined.

The furnace puts through approximately a tonnage of ore of from 70 to 90 tons per day, and produces, on an average, 15 tons of bullion per day.

All the machinery works in splendid order.

The electric light is installed, and furnishes light to all the different departments and dwellings.

The water station also does splendid work, furnishing water through the pipes all over the works.

The railway and haulage lines are completed, and give good satisfaction.

The wood tram connecting the firewood reserve with the works is still in course of completion.

The construction of these works called for a removal of over 50,000 cubic yards of dirt and rock.

Over 1¼ million ordinary bricks, manufactured locally, and some 75,000 fire-bricks, which were imported, were used.

There were also 12,000 bushels of burnt lime used, burnt on the premises, and all sand required for mortar was found on the site.

The foundations for different machines and engines required 800 casks of cement, and half a million feet super. of hardwood went into the erection of sheds.

All the buildings are iron-covered, for which purpose over 50 tons of galvanised corrugated iron were used.

All the buildings are painted with an acid-proof paint, to prevent corrugation by the sulphur fumes from the roasting furnaces.

The total length of small railways in the works is about 1 mile of tracks to facilitate the handling of material.

From the present experience the water supply obtained from Manganese Creek will be sufficient, even in the dry season, as all the waste waters return to the creek above the pumping station to be reused.

It gives us great pleasure to add that the whole appointments of the works have proved themselves efficient to a high degree.

The product obtained out of mostly low-grade ores will be silver-lead bullion of a gross value of, approximately, £35 per ton.

Outside of the men employed at the lime quarry and the wood carters, we give employment now to 150 men.

Yours truly,

MAX. HEBERLEIN, *General Manager.*

The Secretary for Mines, Hobart.

REPORT ON THE PROGRESS OF THE MAGNET SILVER MINE.

Supplied by Mr. G. L. Meredith, Legal Manager, Launceston.

The Magnet Silver Mine is situated about four miles in a westerly direction from Mount Bischoff, on a southern spur of the Magnet Range. It may be reached from Waratah by the macadamised Waratah-Corinna road, which has been constructed by the Government at great expense, and when the work now in hand is completed, should be all that can be desired for extensive waggon traffic, and will doubtless meet all the requirements of the Magnet Mine and others in its vicinity. At the seven-mile peg, on above road, the 2-ft. gauge steel tramway of the Magnet Company infringes on the road, so that, taken altogether, the mine is of easy accessibility from the Waratah terminus of the Emu Bay Railway. The geological features of the vicinity of the Magnet Range, where the mine is located, are Silurian altered slates, in which occur associated igneous rocks of an almost unique character, so far as this island is concerned. The lode itself shows a bold outcrop of hard ferro-manganese gossan near a small stream, which is a tributary of the Arthur River. This material is often in huge blocks, and commonly assays high in silver. The immediate locality is heavily timbered; and the spreading natural branches of the horizontal scrub mark the lode's outcrop to a large extent.

The mine offers remarkable facilities for cheap practical working, by adits driven from an easterly aspect, thus completely obviating the necessity of expensive pumping and hauling machinery. Two permanent water-falls are within easy access of the workings of the mine, and offer remarkable natural facilities for obtaining requisite power for driving ore-dressing machinery, as well as for electrical purposes.

Heavy timber is a common feature in the district, and much of this is well adapted, both for mining and building purposes. Four levels have been driven into the hill, all of which have intersected rich ore bodies of enormous size, and a fifth is now being driven, which will intersect the lode at a still greater depth than has yet been obtained. In all, when this work is completed, there will be not less than 360 feet of ground overhead; and as the continuity of the lode has been proved to extend for considerably over a mile in length, it requires no stretch of imagination to grasp the possibilities of the mine. These facts, coupled with the peculiar intrinsic value of the ore, stamp it as one of the most promising mines among many that this Colony possesses.

The main workings have been carried out in what is known as No. 2 level, which intersects the lode at a depth of over 100 feet. Here, as in the workings above, the greater portion of the argentiferous ore is extensively decomposed, but is always rich in silver and lead. The total width of the actual silver-bearing portion is proved, by the crosscuts and drives, to be over 90 feet, mainly composed of two bodies, 20 and 25 feet respectively, the intermediate space being taken up with decomposed country rock, carrying a fair amount of silver.

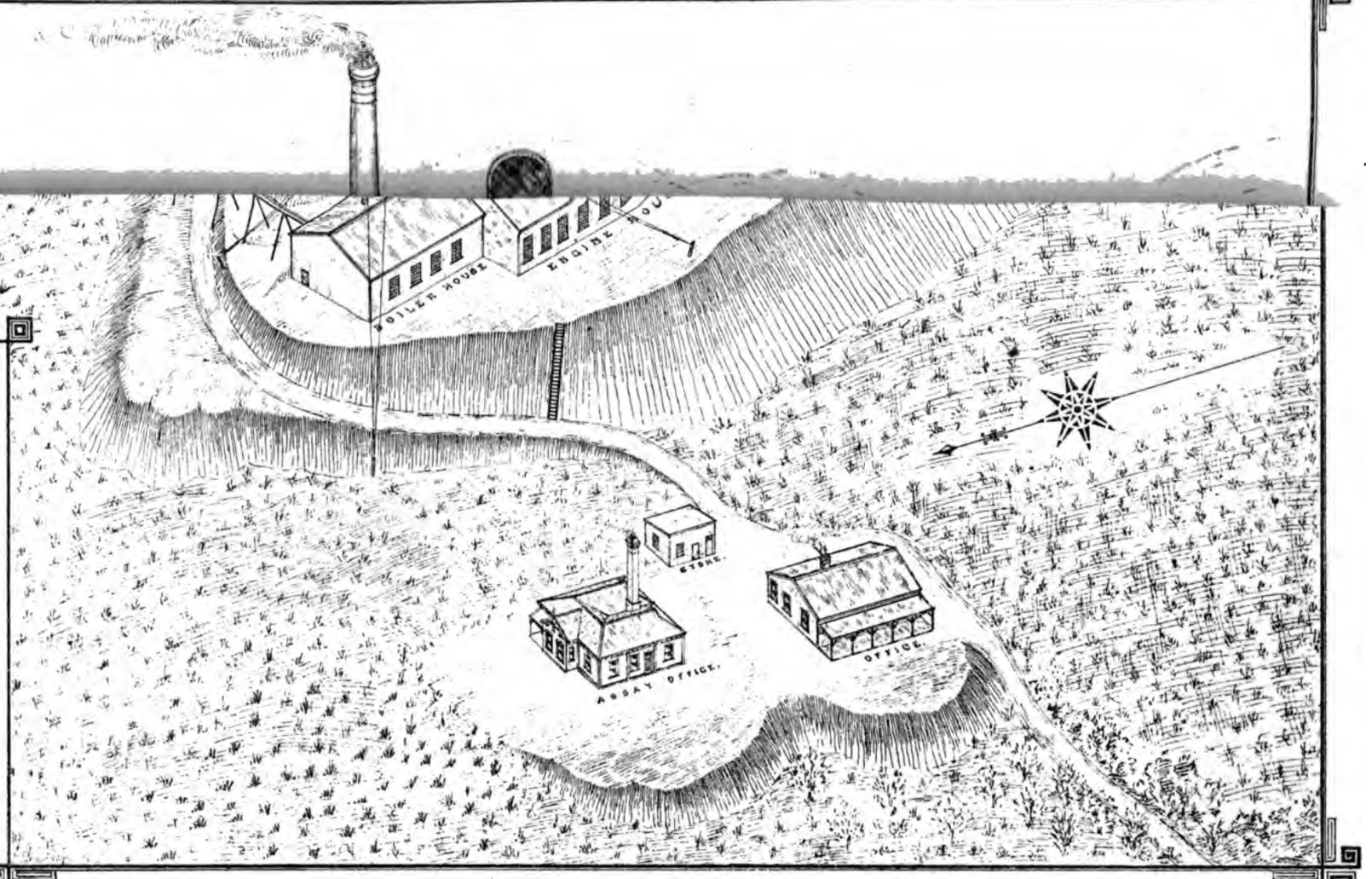
The average metalliferous value of the whole mass is over 30 ozs. silver, about 12 per cent. lead, and a small quantity of gold. The company is breaking out the richer portion of the ore, which consists of bands of associated oxidised and sulphide ores of great richness, often assaying as high as 260 ozs. silver, 70 per cent. lead, and 7 to 8 dwts. gold,—the average value of the ore sent to market being about 120 ozs. silver, 35 per cent lead, and a few dwts. of gold. This ore, as bagged for sending away, contains 27 per cent. of iron oxide, with a small portion of lime, so that it is remarkably adapted for sweetening the zinciferous ores so abundantly produced and sold to the smelting companies in Australia; and for this reason very strong competition for the output of the mine prevails, and the company is therefore able to make extremely advantageous terms for the sale of the ore. At present the company has a contract with

TASMANIAN SMELTING COMPANY LIMITED.

GENERAL VIEW OF WORKS.

SCALE — 64 FEET TO AN INCH.

32 24 16 8 0 32 64 96



the Smelting Company of Australia, and a gradually increasing output is being maintained. The production is somewhat in excess of the facilities at present existing of conveying from the terminus of the company's tramway to the Railway Station at Waratah.

The last shipment, which was made on June 6th, consisted of 1183 bags, weighing 43 tons. The total quantity of ore sold up to date is as follows:—16,555 bags, weighing 581 tons 9 cwt. 3 qrs. 25 lbs., returning a rich value of £7461 16*s.* 6*d.*

The average price realised has been about £15 per ton, gross. The system adopted has been to grade the ore by mixing on the floors to this value. There is an accumulation of about 4000 tons of second-class material in the ore paddocks for future disposal. It is fully expected that within a few months the mine will be able to sustain an output of 200 tons of first-class ore per month. Needless to say, when this desirable end is attained the shareholders will be greeted with substantial dividends.

The policy of the board of directors is to build up a good reserve fund, so that in the future the mine may be provided with first-class ore concentrators, and, if need be, a smelting plant. As regards the latter, the ore in the mine is an easy proposition, as it carries its own flux without any deleterious matter.

As is shown by the lamination of the ore bodies, the lode is a contact fissure, and, as such, its living to impenetrable depth is substantially assured. The gangue generally is carbonate of iron, with calcite. In this material the undecomposed portion of the mass shows regular seams of ore of varying width and remarkable regularity and striking beauty. This is a persistent feature throughout the whole of the workings of the mine. The primary minerals being mainly galena, and the lesser quantity jamesonite, stibnite, and antimonide of silver. The secondary minerals being crocoisite, vanadianite, with massicot, carbonate, and sulphate of lead, and the mixed oxides of antimony and lead, the latter always predominating. Occasionally filiments of native silver occur in aborescent patches, especially on the footwall side of the lode. The adjacent rocks immediately connected with the lode itself are, on the footwall, a dolomatized websterite which, close to the ore-body, becomes beautifully concretionary, and often contains rings and bands of sulphide ore, with occasional native silver. The hanging wall is composed of an igneous rock, usually dark mottled coloration and nodular structure. It is what is known to patrologists as diabase porphyrite, but has no vernacular term, excepting that the miners erroneously term it, among many other sorts of rock, "diorite."

In the last half-yearly report, issued on 30th March, the directors estimate that there is not less than half-a-million pounds' worth of ore in sight. Since then, the work carried out is of such a nature that this value has been considerably extended; and other developments are proceeding apace, and revealing still further available ore-bodies. In No. 2 level a persistent ore-shoot has been driven upon nearly 400 feet, and still continues, both north and south. In No. 4, which will eventually be the main working level, the ore is of extremely high value. Here extensive ore-sheds are in course of construction, and the tramway laid down to same. No ore has as yet been sent away from this portion of the mine; but there is an extensive area ready for stoping.

REPORT ON THE BELL MOUNT AND MIDDLESEX MINERAL FIELDS.

Government Geologist's Office,
Launceston, 6th September, 1898.

SIR,

IN accordance with your instructions I have lately made a second examination of the Shepherd and Murphy Mine, Bell Mount, and while in the neighbourhood visited one or two other sections where a little work was going on. From Bell Mount I went to the Devon Mine on the Dove River, and returned to Sheffield by the old Middlesex Road, crossing the River Forth at the Lorinna Bridge. On my way I visited the Glynn and Golden Hill Mines on the Five-mile Rise, and the old workings at Mount Claude, and have now the honour to present the following Report :—

Shepherd and Murphy Mine.—Since my previous visit to this mine on June 5th, 1897, a considerable amount of work has been done on the lines suggested in my Report, two adits having been driven in a southerly direction, and a total distance of over 1000 feet of driving and 170 feet of sinking done, with satisfactory results. No. 1 adit starts between the outcrops of Nos. 5 and 6 lodes, and the former was cut at about 170 feet from the entrance. 12 feet beyond this another quartz vein was cut, not seen on the surface, and this has been called No. 5A. Both of these lodes are very small, and no work has yet been done on them. No. 4 lode was cut at 267 feet, and has been driven on on either side of the cross-cut, a total distance of 115 feet. Its course is almost due E. and W., with little or no underlay, and its width is from 18 inches to 2 feet, the lode-matter being principally crystalline quartz, containing a good deal of cassiterite and wolfram with occasional bunches of bismuthinite (sulphide of bismuth). In the east drive the lode has been left standing for a length of about 40 feet to avoid double handling, the bin at the entrance to the adit being full of ore. Connection has been made with the surface by a shaft 66 feet deep, sunk on the lode, which increases in size from the surface downwards, and is said to carry good ore all the way down. The old tunnel on this lode from the eastern fall of the hill mentioned in my former Report is about 25 feet above this level, but no further work has been done there. No. 3 lode was cut 93 feet from No. 4, but is small and broken, and does not seem worth driving on at this level. 50 feet further in No. 2 lode was cut, and connected with the surface by a shaft 86 feet deep. Only about 25 feet have been driven on this lode, which averages about 15 inches wide, and contains some good bunches of clean sulphide of bismuth, besides a fair percentage of tin ore, associated with wolfram. The adit has been extended 120 feet beyond No. 2 lode, and if continued should soon intersect No. 1 lode, which at the surface is about 6 inches wide. The country rock passed through is chiefly sandstone with bands of slate, but in the end it is hard quartzite.

From the bottom of the ore-bin, at the mouth of the adit, the track has been cleared and partly graded for a self-acting tramway, about 17 chains long, to the dressing-sheds, nearly 300 feet below, passing by the mouth of No. 2 adit. In this adit, which is 140 feet vertically below No. 1, No. 6 lode was cut at about 50 feet from the entrance, and has been driven on 320 feet. In the east drive it is about 15 inches wide, and in the west 18 inches to 2 feet in two branches, the general strike being about the same as the other lodes, *i.e.* approximately E. and W. The lode carries very good tin ore, in large crystals, and a good deal of wolfram ; occasionally a little sulphideof bismuth occurs associated with iron and copper pyrites, but this lode is not so rich in bismuth as Nos. 2 and 4. A little molybdenite has also been obtained. The gangue is principally quartz, but in places there is a good deal of fluor spar and chlorite, and sometimes kaolinised felspar, which on exposure to the weather crumbles and releases the crystals of tin ore. Where the lode was cut it is only about 35 feet below the surface, and going west along its course the ground is fairly level for about 150 feet, after which it gradually falls, and a shaft about 10 feet from the end of the drive connects with it in about 18 feet. A good pile of crushing-dirt, estimated to contain about 250 tons, has been obtained from this drive, and should give a very good yield of black tin. The adit will have to be driven several hundred feet before cutting No. 5 lode, but it is probable that another lode will be cut between these two. The three lodes which have so far been driven on have increased in width from the surface downwards, but it cannot be expected that they will continue to increase much more, and, as they are still small, it will be very necessary, when crushing is started, to keep the development work well ahead. It is probable that the lodes will eventually enter the granite below,

but at a depth which will not be reached for many years, if ever, though it is likely that the country rock will gradually become harder.

On the tramway track below No. 2 adit, a heavy brownish crystalline rock is seen, consisting almost entirely either of garnet or vesuvianite (probably the latter) this is evidently a product of contact metamorphism due to the intrusion of the granite, with which the lodes are undoubtedly connected. It may have been originally a limestone, which rock Mr. Montgomery, in his report on the district in November 1893, mentions as occurring further east at the Iris crossing. I noticed several small veins of felspar running through it, and in places it contains a good deal of magnetite. One interesting feature about this rock is that it contains a little sulphide of bismuth disseminated through it, and though I do not think that this is present in payable quantities it would be worth while, when the battery is running, to open out a face and make a trial crushing of 20 or 30 tons. If a lower adit is put in it will pass through this rock, and it is quite possible that another lode will be cut, which would probably be rich in bismuth.

The building for the concentrating plant has been erected, and has been made large enough for 20 heads of stamps, with jigs, Frue vanners, and buddles, but it is intended to erect only 10 head at first. Much of the tin ore is in coarse crystals, and a good deal could probably be saved by a roughing-jig, the dirt being first crushed with a stone-breaker or coarse rolls and passed through a revolving trommel before going to the battery. It will not be possible to separate the three minerals cassiterite, bismuthinite, and wolfram mechanically, but as a much better price is obtained for the metallic contents of each ore by itself than when all mixed together, it will probably be found that hand-picking can be advantageously carried on to a considerable extent and, for the same reason it would be advisable to treat the ore from No. 6 lode as far as possible by itself. The stamps and the vanners are to be driven independently by two Pelton wheels, and a dam has been constructed over 500 feet above the machinery site, estimated to contain between two and three million gallons. In dry weather there is very little water running into this, but a water-right of 10 sluice-heads has been taken up on the Weaning Paddock Creek, and it is proposed to bring this in, but the survey for the race has not yet been made.

From the dressing-sheds a sledge track about half a mile long has been made, connecting with the pack-track from Bell Mount. The first part of this is very steep, and a better grade could probably be obtained by a sidling track to junction with Hall's Track close to the five-mile peg. At present it is quite impossible to bring in any heavy machinery. On the Sheffield side, from the end of the formed road, the track has been cleared 20 feet wide to the foot of Bell Mount, a distance of about 3 miles. This is nearly all through good agricultural land, densely wooded, and would soon cut up with heavy traffic, unless corded or metalled. Round Bell Mount there is a hard bottom, and a good grade can be obtained, but a good deal of cutting will be necessary on account of the steep slope of the hill. Some two miles further on basalt country is again met with, and the present pack-track is in a very bad state. All underground work has been temporarily suspended pending the completion of the road and the subsequent erection of the machinery, but 8 men were employed at the time of my visit ground-sluicing the alluvial to the east of the Western Creek alluded to in my previous Report. The "wash," consisting chiefly of angular and sub-angular fragments of quartzite and sandstone mixed with decomposed basalt, is about 10 feet deep, and contains a little tin ore, wolfram, and carbonate and sulphide of bismuth all through it, the average yield at present being a little more than a bag of mixed ore per man per week, which more than covers working expenses. The ground was very heavily timbered, and work is a good deal hampered by the stumps and logs. In the wash occasional boulders carrying tin ore occur, the source of which is as yet quite uncertain. These boulders, some of which have to be broken up with dynamite, consist of glassy quartz crystals (often broken) and fragments of sandstone and quartzite (occasionally waterworn) cemented together with a siliceous paste. They have apparently come from an older cemented drift, but the crystals of cassiterite which are irregularly distributed through them are, as far as can be seen, quite sharp, and the boulders themselves are very little waterworn. To the south and west the country is covered with basalt, and there is good reason to hope that other lodes exist below this, and probably a deep lead, but these are questions which can well be left to a future time when the mine is better opened up.

A little ground-sluicing has also been done on Section 1963-93M, 80 acres, which is now held by the Shepherd and Murphy Company. The wash in the face is about 4 feet deep, consisting of angular fragments of sandstone, and gives very fair prospects of ruby and black tin. With a good supply of water this would probably pay to work, but owing to its elevation this would be difficult to secure. A small race has been brought in through a gap in the divide from the head of the Narrawa Creek, which is on the other watershed running into the Forth, but there is very little water, except in very wet weather. Water could probably be brought in from the Company's dam, but this is not justified at present, as the extent of the wash is unknown, and it is hard to prospect on account of the thick horizontal scrub.

Since my last visit several small lots of hand-picked bismuth ore and concentrates have been shipped to England and sold, and I am indebted to the kindness of the Manager, Mr. Sheargold, for copies of the account sales.

One lot of hand-picked ore, weighing 6 cwt., assayed 63·6 per cent. bismuth, the metal being paid for at the rate of 4*s.* per pound. A second lot, weighing 5 cwt. 2 qrs. 6 lbs., assayed 70 per cent. bismuth, which was paid for at the rate of 3*s.* 10*d.* per pound. The gross value of the two lots was £168 16*s.* 10*d.*, and the net proceeds received by the Company, £152 15*s.* 3*d.*, equal to £264 8*s.* 10*d.* per ton.

The following are copies of the account sales of the concentrates:—

103 bags (sold in Germany) weighing 5 tons net; assay value, 11·5 per cent. bismuth, 39·6 per cent. tin.

	£	s.	d.
Bismuth contents, 11¼ cwts. at £19 18s. per cwt.	228	17	0
Tin contents, 1·98 tons, at £32 per ton	63	7	2
	292	4	2

Charges.

	£	s.	d.			
Smelting, at £6 10s. per ton	32	10	0			
Assaying, grinding, sampling, &c.	11	2	0			
Brokerage, commission, &c.	13	10	0			
Freight to Hamburg, dock charges, &c.	14	2	11	71	4	11
Net value received				£220	19	3

13 bags, weighing 13 cwts. 0 qrs. 26 lbs. net; assay value, 14·25 per cent. bismuth, 47·2 per cent. tin.

51 bags, weighing 2 tons 10 cwts. 3 qrs. 5 lbs.; assay value, 15·59 per cent. bismuth, 46·21 per cent. tin.

	£	s.	d.
Bismuth contents (2 lots), 9 cwts. 3 qrs. 6 lbs., at £19 18s. per cwt.	195	1	10
Tin contents (2 lots), 1 ton 9 cwts. 2 qrs. 23 lbs., at £38 5s. per ton	56	16	2
	251	18	0

Charges.

	£	s.	d.			
Smelting, at £7 10s. per ton	24	0	2			
Assays	3	3	0			
Brokerage and commission	11	18	0			
Dock charges, rent, &c	2	2	4	41	3	6
Net value received				£210	14	6

No mention is made of the tungsten contents, but the price paid for the tin is probably regulated by the percentage of wolfram in the ore. The Manager is now hand-picking more closely, and dividing the concentrates into two classes, coarse and fine. I took samples from the concentrates on hand, which Mr. Ward, Government Analyst, has assayed with the following results :— No. 1. Coarse Concentrates—20 per cent. tin, 33 per cent. bismuth, 9·6 per cent. tungstic acid. No. 2. Fine Concentrates—34 per cent. tin, 6 per cent. bismuth, 14·2 per cent. tungstic acid.

The principal producers of bismuth in England are the firm of Johnson, Matthey and Co., of London, who treat most of the Australian and Bolivian ores, but their process is a secret. The usual method of separating the bismuth from the tin is to carefully roast the finely-crushed ore, so as to convert the sulphide of bismuth into oxide, and then digest the roasted ore with dilute hydrochloric acid. The oxide of bismuth dissolves, and the solution is then drawn off and diluted with large quantities of water, which precipitates the bismuth as oxychloride. Owing to the presence of iron and other impurities, it is generally necessary to dissolve and reprecipitate this once or twice, and it is then reduced to metal by smelting in graphite or iron pots with lime and charcoal. The wolfram remains undissolved in the original residue, together with the tin ore, silica, &c.: on smelting, part of it goes into the tin and makes it hard and less fusible; the rest goes into the slag, making it less liquid, and causing greater loss in tin, through the inclusion of prills. To separate it, the ore is subjected to a preliminary smelting in special reverberatory furnaces, with soda, salt or sulphate of soda, and the tungstate of soda which is formed is leached out with water. Considerable loss of tin is caused by the formation of sodium stannate; and it is said that this loss is not covered by the value of the tungstate obtained, so it does not seem likely that the hopes of being paid for the wolfram will be realised. Probably, however, when regular shipments of concentrates are made, the charges for smelting, assaying, &c., and other incidental expenses will be considerably reduced.

The company has now spent a considerable sum of money, and done a large amount of work, in opening up the mine, clearing, cutting tracks, &c. As before mentioned, the lodes are small; but, in my opinion, the developments are quite sufficient to warrant the erection of concentrating machinery, and I should advise the road being made as soon as the dry weather sets in.

Section 1815-93M, 78 acres.—The Shepherd and Murphy, No. 4 lode, has been traced into this section; and near the north-western corner a deep trench has been cut along its course, and the lode exposed for a length of about 150 feet. It is a well-defined lode, 15 to 18 inches wide, striking E. and W.,—the enclosing country rock being sandstone, striking about E.N.E. The lode-filling is chiefly quartz, affording fine specimens of smoky quartz crystals It carries a good

V

DOVE RIVER DISTRICT.

Devon Mine.—The Devon Silver Mining Company, No Liability, holds Sections 1831-93M, 1938-93M, 1939-93M, and 1940-93M, a total of 160 acres, and this is the only property in the district upon which any work to speak of has been done, progress having been very much hampered by the difficulties of access. The Dove River runs in a southerly direction through the centre of Section 1831-93M, on which the present workings are, the banks on either side being very steep, and in places quite precipitous. The only means of crossing the river is by a rough bridge made of fallen trees; this is often covered with water, the river rising rapidly after heavy rain, and it was partly carried away while I was there.

The principal country rocks are granite and quartz porphyry, with metamorphic slates and sandstones. The normal granite, which is composed of reddish felspar, quartz, and black mica (biotite) is plainly intrusive through the sedimentary strata, which are probably of Upper Silurian age, but it is not at present quite clear whether the quartz porphyry forms a dyke (elvan course) in the granite, or whether it is merely a marginal portion of the granite mass, but I am inclined to think that it is a dyke.

The sedimentary rocks have undergone considerable metamorphism, but the line of contact with the igneous rocks is covered with a thick talus of angular detritus.

About four chains from the northern boundary, and nine chains from the western boundary of Section 1831-93M, a tunnel has been driven 85 feet in a westerly direction about 25 feet above the level of the river. At about 40 feet from the entrance a small vein of gossan carrying a little galena and cerussite was passed through, and at 50 feet a lode was cut carrying about 9 inches of clean galena, but the ore soon cut out when driven on N. and S. In the north drive, which is in 25 feet, the ore made again in about 5 feet, but proved to be only a bunch. In the end it is making again, and there is about 9 inches of good ore in the back of the drive, but in the bottom it is very small; the country rock is quartz porphyry on both walls. Going south the lode was barren for about 12 feet, but near the end, which at the time of my visit was 21 feet from the cross-cut, there is very good ore showing in the back of the drive, cubical and fine-grained galena with a little copper pyrites, the clean ore being in one place about 18 inches wide, but in the bottom of the drive there is only a thread of galena. In the end the vein is split into two branches, each carrying a few inches of clean galena, and for the whole width of the drive there is a little pyrites through the porphyry with small strings of galena. I took a sample of the clean ore from the back of the drive for a length of about 6 feet, which assayed 1 dwt. 15 grs. gold, 87 ozs. 10 dwts. 20 grs. silver per ton, and 73 per cent. lead. The pyrites is also reported to carry gold, and I therefore took a sample across a width of about 4 feet 6 inches which is being saved for seconds, but this only yielded 6 dwts. 12 grs. silver per ton and no gold. The tunnel has been continued 35 feet past the drive in quartz porphyry all the way. Above the tunnel the hill rises at an angle of about 45°, and some high grade galena was obtained from an open cut along the outcrop, the point where the first ore was found, being about 100 feet N. of where it was cut in the tunnel, and about 60 feet above it. A trial parcel of 5 tons 18 cwt. from this cut was sent to the Dapto Works, New South Wales. This parcel assayed 66·6 per cent. lead, 71 ozs. 19 dwts. 19 grs. silver, and 4 dwts. 4 grs. gold per ton, the gross value being £90 19*s.* 3*d.*, and the net value at the works, £64 12*s.*; but the charge for packing the ore to Sheffield was £6 per ton, and freight to Devonport and Sydney had to be paid in addition to this, so that very little profit remained. About 10 tons of first-class ore have been obtained from the tunnel level, which will not be sent away until there is a better track to the mine. The ore in the open cut occurs in the same bunchy way as in the drive. From the frequent "slickensides" that are seen it is evident that there has been a movement of the wall-rocks, and the lode occupies a fault fissure. The section of the original fissure appears to have been a series of short curves, and by the movement of the walls relatively to one another small open spaces were formed which are now filled with ore, while at the same time the wall-rock was more or less shattered. I am of opinion that the lode will be patchy throughout both in strike and dip, the ore occurring in bunches or pockets rather in regular shoots, but it is likely that the bunches will be fairly frequent. In stoping it will be necessary to take out the whole length, as the ore is likely to make a few feet above even where the lode is barren in the back of the drive.

The course of the lode is nearly N. and S. approximately parallel to the hill, so that the steep rise of the latter is not of much advantage unless other parallel lodes be discovered further up. Of this there is some likelihood; and to the S.W. of the tunnel, about 200 feet above it, a vein of manganese gossan about 18 inches wide is seen, striking apparently a little W. of N. and underlaying E., which is worth further attention. Surface prospecting is rendered difficult, owing to the thick accumulation of detritus from the disintegration of the rocks above. No work has been done on the northern sections, and I did not visit them.

Going west from the tunnel workings, the river is again met with in about three-quarters of a mile, having taken a sharp bend, and the intervening ridge is about 900 feet high. Several sections have been applied for on the other side; and I was shown samples containing galena, cerrusite, and zinc blende, said to have come from a formation 11 feet wide, on one of these sections; but unfortunately, owing to the river being flooded, I was unable to get across to see this. The country rocks on the ridge consist of slates, sandstones, and grits, much indurated and altered to hornstone and quartzite, which in places stand out in precipitous cliffs, owing to their superior hardness resisting the influence of weathering. The general strike appears to be nearly E. and W., and the

dip at high angles to the N. There is no direct evidence as to the age of these rocks, but they are certainly as old as Upper Silurian, and may be Lower Silurian.

South of the Devon Mine several sections have been taken up, but no work was going on at the time of my visit, and very little prospecting has yet been done.

From general considerations, it may be said that the district is a likely one for the occurrence of minerals, consisting as it does of the older sedimenatry strata, traversed by intrusive igneous rocks; and, although granite is not generally supposed to be favourable for lead ores, the high-grade ore obtained at the Devon Mine should encourage further prospecting. Probably at a depth the galena will give way to copper pyrites. An effort should be made to trace the lode into the sedimentary rocks, in which it is likely to be more productive. The great bar to prospecting at present is the expense and difficulty of getting supplies. The pack-track made by the Devon Company is far too steep, rising 1500 feet in the first mile and a-half. The level of the Devon Camp is about 300 feet above the Forth Bridge at Lorinna; and, though the country is a good deal furrowed with deep gullies, it is said by those who know the country well that a good track could be obtained from the bridge to the Devon in five or six miles by following the Dove down to its junction with the Forth. A good deal of this would be in rotten granite, which makes an excellent track; and I should advise a rough survey of this being made at once. The present track joins the Middlesex Road on the Five Mile Rise, 1400 feet above the Lorinna Bridge.

FIVE MILE RISE GOLD FIELD.

Glynn Mine, Sections 720-93M, 721-93M, 1010-93M, and 1011-93M, a total of 30 acres.—Until recently this mine was worked by tributors, who at considerable expense erected a small five-head battery and portable engine. The workings are situated on Section 1011 at an elevation of nearly 2000 feet above sea level, and the tributors got out several small crushings from an open cut about 85 feet long along the reef. The last 55 tons crushed, of which 35 tons were classed as seconds, yielded 19 ozs. of gold. The reef runs a little W. of N. with a slight underlay to the W., and the enclosing country rocks are slates and argillaceous sandstones dipping at very low angles to the north, and striking nearly E. and W. To the N.E. the country is covered with basalt, which in places has a vesicular structure, and contains abundant zeolites. From the end of the tributors' workings a winze was sunk 16 feet and connected with a shaft 35 feet deep sunk on the top of the ridge to the west of the line of lode, and the country in the cross-cut between the shaft and the winze is said to have carried a little fine gold throughout; but all these workings are now inaccessible. Above the open cut are several large isolated boulders of conglomerate said to contain a little gold, but I do not consider these of any importance, except as showing that the older rocks from which they were derived were gold-bearing. The company has now resumed work, having bought the tributors out, and a tunnel has been driven west about 25 feet below the old workings, the lowest point available to serve the battery at the present site. At 49 feet the reef was cut about 3 feet wide, and has been driven on N. about 26 feet, but it had pinched a good deal in the end when I saw it. The reef may be called a "mullocky" one, consisting chiefly of crushed country rock with rubbly iron-stained quartz. Very fair prospects of fine gold can be obtained with the dish, but the gold is said to be of very poor quality, being worth only about £2 10*s.* per ounce, owing to the large proportion of silver. Comparatively little stone is available above the present level, but quite sufficient to prove whether it can be treated at a profit, which there seems good reason to hope, as it can be cheaply mined and easily crushed, and a yield of ½ oz. per ton should pay all expenses; doubtless, too, better results will be obtained when the battery, which is now exposed to the weather, is covered in. I consider that the reef is likely to live down, but it is probable that below the water level there will be a considerable percentage of pyrites, and a winze should be sunk to ascertain this. Water for the boiler and for battery purposes is very scarce in summer. A small steam-pump has now been obtained, and it is intended to pump the water from the so-called Big Creek, which runs close to the battery, about 25 feet below it, but I believe there is very little water in this creek in very dry weather. Several chains lower down the creek a little work has been done on a quartz formation carrying a large proportion of iron pyrites which is said to contain silver, but the old prospecting drive was inaccessible, and no opinion could be formed as to the size and probable value of the formation.

Golden Hill Mine, Sections 348-93G, 349-93G, 350-93G, and 351-93G, 10 acres each.—These sections lie a short distance to the west of the River Forth, near the bottom of the Five Mile Rise; and, till recently, were worked privately. A good 15-head battery, which formerly stood at the New Caledonian Mine, has been erected close to the river; and this is connected with the mine by a wooden tramway about half a mile long, having a fall of about 200 feet. The country rocks are very similar to those at the Glynn Mine, consisting of fine-grained sandstones and slates, lying very flat, and striking about E. and W.; but I saw no sign of any fossils which would indicate their age.

The present company is working in a drive started by the former proprietor, who drove a tunnel a total distance of 317 feet, in a general south-westerly direction. At 287 feet a lode formation was cut, which has been driven on about 70 feet to the S.E.,—the strike being about S.E. and N.W., underlaying S.W. The ore consists of iron pyrites and zinc blende, in places very free from gangue, but generally disseminated through a hard siliceous matrix, and on the hanging-wall is a small oxidised vein carrying a little free gold. The lode-channel appears to be a true

fault-fissure, originally partly filled with crushed country rock, which has been silicified by percolating solutions, which at the same time deposited the sulphides. At 165 feet from the entrance a vein of oxidised lode-matter was passed through, which seems worth following; and, since my return, I have been informed that what is probably the continuation of this has been found on the surface, 60 feet above the tunnel. Where cut, it is said to show about 3 feet wide of gossan; and a trial crushing of 12 tons, taken from an open cut, yielded half an ounce of gold per ton. A small creek runs to the N.E. past the mouth of the tunnel; and a short distance up this, W.N.W. from the mouth of the tunnel, a seam of blende and pyrites about 2 feet wide is seen in the face of a cliff, cutting right across the bedding of the country. This is probably a continuation of the lode worked in the tunnel.

At the time of my visit, a trial crushing of 50 tons was being taken out from the tunnel-level, and the battery was crushing with eight heads. I have since heard that the 50 tons yielded 11½ ozs. of gold from the amalgam; but the stone contained a large percentage of pyrites and blende, and the sands have been stacked for future treatment. I took a sample from the launder at the bottom of the plates, which gave, on assay, 8 dwts. 4 grs. gold per ton. Below water-level it is probable that there will be little or no free gold; and the future success of the mine largely depends on the treatment of the sulphides. They could be easily concentrated on a vanner or rotating table; and a fair bulk sample should be taken from the accumulaled sands, and carefully washed and assayed, to ascertain if this would pay.

Alluvial Workings.—A good deal of alluvial gold has been obtained from the Five Mile Rise at various times; but the difficulty of obtaining a permanent supply of water has always been the great drawback.

To the east of the Glynn Mine, Mr. O'Rourke has an alluvial claim, on which he has done a large amount of work. He has a water-right of 2 sluice-heads on Big Creek, and this is brought in by a race about half a mile long into a small dam, from which a line of pipes conveys it to the face; but the pressure is not sufficient for effective hydraulicking, and the supply is very poor in summer. The "wash" consists of angular fragments of sandstone, and in the highest face is about 16 feet deep, with one or two hard bands of ironstone cement. The bottom consists of slate and sandstone, with a very flat dip. The gold is mostly coarse, and very little water-worn; and the appearance of the "wash" shows that it has not travelled far, but no reefs have yet been discovered which could have shed the gold.

A little gold is said to be obtainable nearly everywhere from the surface-gravel formed by the disintegration of the bottom "in situ," and it is probable that this is largely derived from small stringers in the country; but there is still a good chance of discovering a payable quartz reef.

MOUNT CLAUDE.

Very little work has been done here since Mr. Montgomery reported on the district in 1893, and all the ground was afterwards forfeited; but attention is again being directed to the locality, and several sections have been recently taken up again. The long tunnel started by the Mount Claude Silver Lead Mining Co., and continued in turn by the Southern Cross Proprietary Silver Mining Co. and the Kentish Proprietary Silver Mining Co., was extended to 850 feet, and again abandoned. The end is in hard crystalline limestone, and I could see no sign of any lode formation corresponding to the gossan outcrop on the surface. This section, formely 90-87M, is now numbered 2093-93M, having been recently taken up on the old lines in the name of W. D. Tune, and I believe a company has been formed in Sheffield to work this, the intention being to sink a shaft on the line of the gossan outcrop west of the line of the tunnel, but operations had not been started at the time of my visit. The old workings higher up the creek were inaccessible, owing to a flood in the creek. The strata are here seen to be very much crumpled and folded, and it is impossible to see what is the normal strike or dip. All the high peaks are capped with coarse conglomerate, the beds of which are, in places, seen to be also much curved and folded, but it is not quite clear whether they belong to the same age as the sandstones, slates, and limestone seen lower down, or whether they are younger than these, and rest unconformably upon them.

The only work that was going on at the time of my visit was on the north side of the Mount Claude Creek, about 10 chains from the end of the old tramway. A hole has been sunk close to the line, and for a width of seven or eight feet there are several small veins of galena up to 3 inches in in thickness, with a little iron and copper pyrites and zinc blende, and the country rock is all more or less mineralised. The apparent strike of the veins is about S.E. and N.W., with a slight underlay to the N.E. into the hill, but from the nature of the occurrence they are likely to be very irregular both in strike and dip. Below the tram to the S.W. the ground falls rapidly towards the Mount Claude Creek, and a tunnel had just been started which, in about 30 feet of driving, should intersect the veins seen above at a depth of about 25 feet; but it would be advisable to continue the tunnel until clean country is met. In the approach to this tunnel small strings of galena are seen, and there is also a good deal of galena finely disseminated through the country rock, which is a hard metamorphic sandstone or quartzite. Forty feet lower down several small veins of galena and copper pyrites are seen in the joints of the country at the foot of a perpendicular cliff. The country has evidently been shattered and permeated by mineral bearing solutions for a considerable width, and the formation partakes rather of the nature of a stockwork than a

lode, but it is quite possible that at a depth a clean fissure may have been formed, in which case the ore would probably be more concentrated. Several tons of good concentrating ore have been obtained from the cut near the tram, and picked samples are reported to have assayed from 60 to 71 per cent. lead and 42 to 58 ozs. silver per ton, with traces of gold. One sample, described as quartz only, without any visible ore, is said to have yielded 9 per cent. lead, 8 oz. 6 dwt. 4 grs. silver per ton, and 3 dwt. 6 grs. gold per ton.

Further S.E. at the foot of a cliff above the tram a rather promising looking vein of coarse and fine grained galena with a little copper pyrites is seen, and a sample which I took from here assayed 72·6 per cent. lead, 39 ozs. 4 dwts. silver, and 1 dwt. 15 grains gold per ton. A good deal of first-class ore could be picked from the small veins of galena, but no dependence can be placed on the continuance of any individual vein, and the proposition is at present mainly a concentrating one, but one which seems to offer very fair prospects of success. I do not know how much water the Claude Creek carries in summer, but it drains a good deal of country, and judging by the amount of water in it at present, it seems probable that a good supply could be obtained for concentrating purposes. There are good facilities for mining by means of adits, and the ore could be cheaply carted to Railton *viâ* Sheffield, a distance of about 23 miles. There is a good road from Sheffield to the agricultural holdings near the head of the valley of the Dasher River, and from here to the old Mount Claude tramway a good road could be made at small expense. The Lorinna road branches off about a mile and a half from the tramway, and passes over the top of Mount Claude and Oliver's Hill (a continuation of Gad's Hill.) The machinery for the New Caledonian and Glynn batteries was taken over this road, but at very great expense. Going over Mount Claude it is very steep, rising over 1100 feet in about two miles, and from the top of Oliver's Hill down to Lorinna there is a fall of nearly 1800 feet in under four miles. The road has only been formed in places, and the grades are so steep that the water soon wears deep channels, making it quite unfit for wheeled traffic. On the Forth side there is some good agricultural land, densely wooded, but I do not know what extent there is. The level of the Lorinna Bridge is only about 200 feet below that of Sheffield, and it is probable that a much better route for a road could be obtained by keeping as close as possible to the river, but, from the broken and rugged nature of the country, this is likely to be a very expensive undertaking, not justified by the present development of the mines.

I have the honour to be,
Sir,
Your obedient servant,

J. HARCOURT SMITH, B.A.,
Government Geologist.

W. H. WALLACE, *Esq., Secretary for Mines, Hobart.*

REPORT ON THE PENGUIN AND DIAL RANGE MINERAL FIELDS.

Government Geologist's Office,
Launceston, 20th October, 1898.

SIR,

I HAVE the honour to submit the following Report of a brief examination of the above-fields.

The general geology of the district was fully described by the late Government Geologist, Mr. A. Montgomery, M.A., in a Report dated 29th July, 1895, the conglomerates, breccias, and tuffs of the Dial Range formation being provisionally referred to the Devonian System, and very little additional light has since been thrown on the subject. North of the Dial Creek, near the River Leven, a belt of syenite was noticed. I could not ascertain whether this is intrusive or not, but it may represent the root of the volcanoes from which the tuffs were ejected.

I only visited places where work was actually going on, or where something has been done since Mr. Montgomery's visit.

PENGUIN DISTRICT.

Section 2385-93M, formerly 155-87M.—The shaft of the old Penguin Mine is situated on this section just above high water-mark, close to the township of Penguin. It is said to have been sunk nearly 30 years ago, but no work has been done for many years until quite recently, when the shaft was unwatered and the old drives cleaned out by a Melbourne syndicate, on account of the high assays which are reported to have been obtained. The shaft is 6 feet by 8 feet in the clear, timbered with 10-inch by 10-inch frame-sets, and, except near the surface, the timber is still quite sound. Including the well, it is about 70 feet deep, and at 60 feet from the surface a considerable amount of driving has been done both N. and S. of the shaft. The country rock passed through in the drives is chiefly a hard siliceous dolomite more or less impregnated with pyrites. There have evidently been considerable differential movements within the mass, and numerous smooth "heads" have been developed, which are generally faced with calcite and iron pyrites; the latter also occasionally occurs in bunches with a little copper pyrites and tetrahedrite, but, as far as I could see, there is nothing like a regular lode, and the drives appear to have followed the heads in the country.

On the north side of the shaft there is a very roomy chamber from which the drive starts in a north north-westerly direction towards the sea, but gradually bears round to nearly east. About 8 feet from the end is a winze 12 feet deep, which was full of water at the time of my visit; this has since been baled out, and I have been shown samples from the bottom containing a good deal of copper pyrites and tetrahedrite with dolomite. The ore is said to be about 4 feet wide, but it is probably only a bunch. About 40 feet from the end a cross-cut has been driven 50 feet to the east without disclosing anything of value. South of the shaft about 150 feet of driving has been done in various directions, and a winze sunk 20 feet (now full of water), but I could see nothing to encourage further work being done. Although the north drive is all under the sea at high water, there is comparatively little water making, and the workings are kept dry by baling one shift with a whip.

About a chain east of the shaft, a prospecting shaft has been sunk about 20 feet. This is now full of water, but the stuff at the surface shows a good deal of iron pyrites, with a little galena, blende, copper pyrites, &c. in strings through the country, which consists largely of steatite, with bright green chlorite, magnesite, and calcite. At 8 feet down there is said to be about 3 feet of ore, which dipped out of the shaft to the east, but the manager informed me that a sample which he took from there returned only 15 grs. gold, 1 oz. 18 dwts. silver per ton, ½ per cent. copper, and ½ per cent. lead. I took a rough sample from some of the stone lying about the shaft, and sent it to Mr. Ward, the Government Analyst, but it did not contain appreciable quantities of any valuable metal.

Several small holes have been sunk on the beach below high-water mark, and for some distance on either side of the main shaft numerous small veins are seen, carrying oxide of iron and sulphides of iron, copper, lead, and zinc; but none of them, so far as could be seen, are rich enough or large enough to work, and there is no regularity in strike or dip. There is a possibility that at a greater depth they may come together and form a good lode, but at present the prospects do not seem to me to warrant the expense of proving this.

Hematite Deposits.—On the east side of Penguin Creek, between two and three miles from its mouth, some work has been done by a Sydney syndicate, known as the Tasmanian Iron Company, on Mr. Hudson's property, where two quarries have been opened on the hematite

deposit mentioned in Mr. Montgomery's Report. No work was going on at the time of my visit, and I have been unable to obtain particulars as to the quantity and quality of the ore obtained, but several hundred tons were sold as flux to one of the New South Wales Smelting Companies, and I was informed that it averaged over 90 per cent. peroxide of iron. In the face there is from 15 to 20 feet of ore, a large proportion of which is very pure, dense, red hematite, but some parts are rather earthy and impure. Very little stripping is necessary, and, if systematically developed, large quantities of good ore could be very cheaply mined, but at present the costs of transit are too high to allow of much profit. From the quarries a wooden tramway about a mile long has been made down the valley of the Penguin Creek, which stream is crossed five or six times, and from the end of the tram the ore had to be carted over a rough road to Penguin wharf, whence it was taken in lighters to Devonport. The natural outlet is right down the Penguin Creek to its mouth, but the proprietors have been unable to come to terms with the owners of the properties through which the line would pass. The tram is now being extended to meet the Iron Cliffs Road, but the ore will still have to be handled twice, and carted a distance of nearly a mile to the wharf. When the Ulverstone-Burnie Railway is constructed the ore will doubtless be sent to the latter port, and it should be possible to put it on board ship there for about five shillings per ton.

Going south the hematite is seen outcropping in several places, and on Mr. Good's property a small quarry has been opened in which there is about 10 ft. of good ore. This is about 150 ft. higher than the Tasmanian Iron Company's workings, and is probably a separate deposit. The Iron Cliffs Road runs close to the quarry, the distance to Penguin being about 3½ miles, and several small lots of ore were sent away, but, owing to the steep grades on the road, the cost of carting was too high to allow of profitable working. A good grade could be obtained for a tramway down the valley of the Penguin Creek, and, should iron smelting works be established on the mainland, these deposits would be well worth further attention.

Iron Cliffs.—South of Mr. Good's farm, two mineral sections, Nos. 1785-93M, 78 acres, and 1661-93M, 79 acres, have been taken up, through which runs the immense outcrop of brown hematite known as the Iron Cliffs. This is described in Mr. Montgomery's report before alluded to, but, at the time of his visit, no work had been done on it. Shortly afterwards a crosscut tunnel was started, about 25 ft. above M'Bride's Creek, and driven 260 ft., bearing S. 70° E. The country passed through is soft slate and sandstone, much stained with oxide of iron, and, about 40 ft. from the end, a gossan formation was cut striking nearly N. and S. and underlaying to the east. This is about 20 ft. wide, and is succeeded by about 8 ft. of country, after which gossan again appears and continues to the end of the tunnel, the eastern wall not having been reached when work was suspended. It would have proved the lode much better had the tunnel been driven north along its course from where it is cut through by the creek a few chains to the south-east. The gossan is similar to that seen on the surface, consisting largely of compact limonite in botryoidal and stalactitic forms; but there is a good deal of friable porous gossan of rather kindly appearance, and, in places, veins of quartz. I took a sample across the whole width of about 30 ft. exposed in the tunnel, but it contained no appreciable quantity of copper, silver, or gold. Above the tunnel the outcrop of the lode forms a ridge between M'Bride's Creek on the west and a deep blind gully on the east, and the configuration of the country is naturally favourable to the thorough oxidation and leaching of the metallic contents of the lode. Under these circumstances the absence of copper is not surprising, and it frequently happens in copper-bearing lodes that the copper contents have been leached out of the upper parts of the lode and redeposited in a concentrated form at a lower level. The absence, however, of silver and gold in the gossan is distinctly unfavourable, as these metals are generally concentrated in the oxidised portions of the lode; but it is quite possible that richer chutes would be met with in driving along its course.

Further north the lode is cut across by another deep gully, the highest point of the outcrop to the north being over 300 ft. above the bottom of the gully. The outcrop is here very wide, and the ground falls rapidly towards M'Bride's Creek, but further north and to the east basalt comes in, the ground being fairly flat, and it is probable that the lode-matter will not be so thoroughly oxidised as it is further south. From the compact nature of the gossan it seems probable that the greater part of the lode-filling was originally iron pyrites; but the lode is well worth a further trial, and since my visit a company called the Lady Braddon Mining Company has been formed to test it. To prove the value of the lode it is absolutely essential to get below the water-level, and I should advise driving a low-level adit underneath the big outcrop and then sinking a winze as deep as the water will allow.

A road could be easily made to connect with the Iron Cliffs Road in less than a quarter of a mile, so that the property is very easily accessible.

About 10 chains a little south of east from the tunnel is an old prospecting tunnel about 300 feet long, which was driven some years ago, and is now partly fallen in. The country passed through is chiefly soft slate and sandstone, striking nearly north and south, and dipping at high angles to the east. There is a good deal of pyrites through it, the water coming from the tunnel being heavily charged with oxide of iron, and in places the sides of the drive are stained with copper salts, but I could see no sign of any lode. Further north is another small tunnel about 50 feet long through brecciated conglomerate. The sides in places show the characteristic green

copper stainings, and near the entrance is a small vein of rubbly quartz from which fair prospects of native copper can be obtained by panning, but this is too small and ill-defined to be of much value.

DIAL RANGE FIELD.

This field lies between six and seven miles almost due south of Penguin, and occupies a narrow strip between the Dial Range and the River Leven. The ground was originally taken up for silver seven or eight years ago, but very little work was done, and all the sections were soon forfeited. Recently most of the ground has been taken up again with different boundary lines for copper, but the only sections on which any work to speak of has so far been done are those of the Keddie Copper Mining Company and the Dial Range Prospecting Association.

Access.—From Penguin there is a fair road to the agricultural holdings at the foot of Mt. Montgomery. The land passed through is very patchy, rich, chocolate-coloured soil, due to the decomposition of basalt, alternating with barren healthy patches. From the end of the road there is only a rough bridle-track, which has been partly formed in places. Numerous small creeks are crossed, but a good track could be constructed with no great expense.

The field can also be approached from Ulverstone by going up the Leven in a boat to what is known as Hay's Landing, about six miles from Ulverstone, and thence following the river to the Dial Creek, a distance of about three miles. The river is in places very shallow, and a good deal of expense would have to be incurred in dredging and snagging to make it navigable for small steamers.

Keddie Copper Mining Co.—This company holds Section 2638-93M, 80 acres, which includes parts of the old leases 2605-87M, 3469-87M, and 3472-87M. The Dial Creek runs through the centre of the property, and on the south side of this a tunnel is being driven, bearing S. 35° W., to intersect a lode which is seen outcropping near the top of the hill about 160 feet above the tunnel level. The country rock passed through is chiefly breccia, varying a good deal in texture and composition, but consisting principally of angular fragments of slate and sandstone, mixed with volcanic ash. Some parts are extremely soft and porous, while in other parts the rock is much silicified, and it frequently contains iron and copper pyrites, carbonate of iron, &c., irregularly disseminated through it. At 70 feet from the entrance an intensely hard formation was struck, consisting of an intimate mixture of fine-grained iron pyrites and quartz. Near the bottom it is six or seven feet wide, but does not rise to the back of the drive. This may be the continuation of the lode seen in the creek where the track crosses it N.W. from the tunnel, but it has not a very promising appearance. I visited this property twice, and at the time of my second visit on October 18th the tunnel was in 113 feet, the end being in hard breccia, letting out a good deal of water. It is probable that a change will soon come in, as the older Cambro-Silurian strata are seen outcropping a short distance higher up the hill.

About 75 feet above the tunnel is an old shaft 16 feet deep, and the tip shows a little iron and copper pyrites. Just below this, a few shots have been put into an outcrop of quartzite and hornstone, showing specks of copper pyrites and malachite. It resembles more a band of silicified country than a lode; but the tunnel will soon prove if it is of any value.

Two or three chains further south, and 85 feet higher up, is another old shaft said to be 20 feet deep, sunk in gossan of rather kindly appearance. This is the outcrop of the lode for which the tunnel is being driven: its strike is apparently about N. 20° W., and its underlay to the E.N.E. It is probable that the tunnel will strike it well below the zone of oxidation, and will therefore have a good chance of proving its value.

At the top of the spur, close to the southern boundary, is another rather promising-looking gossan outcrop, running apparently N.E. and S.W. A little work was done on it some years ago, but not sufficient to prove its value. Several other outcrops of gossan are seen on this section and on the adjoining section to the west; but they all require to be sunk or driven upon before any opinion can be expressed as to their value.

South-east from the tunnel, on the east side of a small creek running into the Dial Creek, a few shots have been put into a formation consisting of quartz and iron pyrites intimately associated, which, as far as can be seen, is about 10 feet wide, striking N.W. and S.E. To the S.E. the hill rises very rapidly, and the outcrop can be traced for a considerable distance, the pyrites gradually giving place to gossan. I took a sample by chipping from the pyrites exposed, but this yielded, on assay, only 1 dwt. 15 grs. gold per ton, no silver and no copper. It might be worth while driving on the course of this in the hope of meeting richer chutes, and, in the event of good ore being found, a short cross-cut could be driven from Dial Creek, into which the above-mentioned tributary falls, with a drop of about 40 feet, but present appearances are not very favourable.

Dial Range Prospecting Association, Sections 3188-93M, 3189-93M, 3190-93M, and 3191-93M, 80 acres each.—On Section 3191, close to the S.E. angle, which is the centre of the property, a pyrites lode about 7 feet wide, striking nearly N. and S., and underlaying E., is seen in the bed of a small creek. The ore is very free from gangue, consisting principally of crystalline iron pyrites, with bunches of very pure copper pyrites, frequently much tarnished and coated with

black oxide of copper. The bed of the creek has been lowered, and a tunnel bearing N. 20° W. has been driven a distance of about 70 feet. The country-rock is very soft tufaceous breccia, requiring close timbering, and it is difficult to see exactly what has been passed through, but the drive appears to have gone diagonally across the lode. The end is in breccia, with a little pyrites through it, and I should advise cross-cutting E. to try and pick up the lode. It is quite possible, however, that it has dipped under foot to the north, the fissure not extending to the surface in the soft breccia. I took a fair average sample of the lode across a width of about 6 feet near the entrance of the tunnel, which Mr. Ward found to contain 3·2 % copper, traces only of silver and gold; but much better assays are reported to have been obtained.

In several places the sides are stained green from the copper salts leaching out, and the trunk of a tree fern which had been lying for some time at the foot of the seconds tip has become saturated with copper sulphate in solution, so that when any bright piece of iron or steel is thrust into it it is immediately coated with metallic copper.

Much of the ore is very friable, and it is probable that a good deal of the contents has been dissolved out and reprecipitated at a lower level. Unfortunately, going north from the mouth of the tunnel the ground is comparatively flat for a considerable distance, and it is impossible to put in a lower adit. Even as it is, there is a descent of several feet into the tunnel, and the stuff has to be wheeled up an incline and taken some distance for a suitable dump.

The best way to properly test the lode would be to sink on it, and there is a good probability of the copper contents increasing with depth, but water is likely to prove heavy, and, with the present means of access, it would be impossible to bring in any heavy machinery.

About 100 feet south of the tunnel is another small branch creek, in the bed of which some pyrites is showing, but its full width is not seen. South of the creek a second tunnel is being driven bearing S. 10° E., and at the time of my visit this was in about 120 feet. The country rock passed through consists of felsitic tuff and breccia: near the entrance it is much stained with oxide of iron, and for the last 40 feet there has been a good deal of iron pyrites and quartz with vughs containing black oxide of copper, but there is no defined lode. Near the top of the hill, 120 feet above the tunnel, is a strong outcrop of hematite with veins of quartz, probably the capping of a pyrites lode, and the tunnel is now being turned to come under this.

A short distance up the creek, S.W. from the tunnel, the Cambro-Silurian strata are seen, consisting of alternate bands of slate and sandstone, striking about N.W. and S.E., and standing almost vertical. The tuffs and breccias appear to have been laid down on a very uneven bottom, unless, as is probable, they have been brought into their present position by a fault. This is a point of some importance, as the lodes are likely to be better defined and more productive in the older rocks.

As before mentioned, practically no work has been done outside the properties already described, but the indications are sufficient to warrant more thorough prospecting.

I have the honour to be,
Sir,
Your obedient Servant,

J. HARCOURT SMITH, B.A.,
Government Geologist.

W. H. WALLACE, *Esq.*,
Secretary for Mines, Hobart.

REPORT ON THE DISCOVERY OF GOLD AT PORT CYGNET.

Government Geologist's Office, Launceston,
9th December, 1898.

Sir,

In accordance with your instructions, I have visited Port Cygnet and examined the work that has been done in the locality in search for gold, and have now the honour to submit the following Report :—

Locality and Access.

Port Cygnet is really a branch or arm of the River Huon, about five miles long and from half a mile to two miles broad, running in a general northerly direction, but the name is generally applied to the township of Lovett, which lies at its head, distant by road about 34 miles from Hobart. Lovett is the centre of a large fruit-growing district, and although alluvial gold was discovered over ten years ago near Lymington, it is only quite recently that it has been discovered *in situ*.

General Geology.

On the eastern shore, going up from Garden Island, flat-bedded sandstones and mudstones are seen, and at Mount Cygnet, about four miles east of Lovett, a coal seam is being worked, which Mr. R. M. Johnston has determined to belong to the upper division of the Lower Coal Measures (*Permo-carboniferous*), corresponding with the Adventure Bay beds.

In the immediate neighbourhood of Lovett argillaceous sandstones and mudstones also occur, but it is difficult to distinguish their bedding-planes ; the discovery of fossils of Spiriferæ and Fenestellæ near the Livingstone Mine and elsewhere proves that they belong to the marine beds of the *Permo-carboniferous* system. The principal rocks of the district, however, are of igneous origin, and, from their great diversity, they offer a most interesting petrological study. They apparently occur both as contemporaneous sheets (lava flows intercalated with the sedimentary strata) and also as intrusive dykes. They are essentially porphyritic in structure, consisting of felspar crystals in a compact ground mass, which in different parts is white, ashen gray, brown, yellow, greenish, and occasionally almost black. The felspar crystals are sometimes small and numerous, evenly distributed throughout the mass, giving the rock at first sight the appearance of a holo-crystalline structure ; occasionally they are few and unevenly distributed, and in some cases the rock is almost entirely made up of large tabular crystals up to 1½ inches long and one inch wide, the edges of which are sometimes rounded and corroded. They are frequently partly kaolinised, but in unweathered pieces glassy crystals of sanidin can be recognised, and from their tabular habit it is probable that many of the larger kaolinised crystals are also sanidin. Hornblende is frequently seen, and occasional crystals of triclinic felspar can be recognised by the fine parallel striations due to repeated twinning. In some parts there is a good deal of pyrites disseminated throughout the mass. Although there is such a diversity in these rocks they all bear a strong family resemblance, and, pending microscopical examination, which is now being undertaken by Messrs. Twelvetrees and Petterd, they may be provisionally classed as Trachytic Porphyries. With few exceptions they do not, as might have been expected, form bold outcrops, and no attempt was made to define their limits, but they are said to extend right through to Oyster Cove.

A short description will now be given of the mining work that has been done.

Livingstone Mine.—This property lies about two miles N.E. of Lovett, and consists of two 20-acre sections adjoining Lot 198 of 500 acres purchased by John Thorp, jun. These sections have recently been granted as reward claims for gold to the original prospectors, Wm. Anderson and J. Thorp, who had previously done a considerable amount of work. A narrow ridge runs through the sections in a N.E. and S.W. direction, and on the western fall of this, near the top, at an elevation of about 630 feet above sea-level, a quartz reef was discovered, on which an underlay shaft has been sunk to a depth of about 60 feet. The reef varies in thickness from about 2 ft. 6 in. to 4 feet, and strikes, as far as can be determined at present, about N. 70° E. Near the surface it is almost vertical, but at the bottom of the shaft has a considerable underlay to the S.S.E. The quartz is in places fairly solid, but generally occurs in small parallel bands separated by thin seams of decomposed porphyry, which give it a somewhat laminated appearance. The country rock on either wall is a brownish, somewhat decomposed porphyry, which has been locally called diorite. The manager kindly showed me the assay certificates of several samples of the quartz sent to Melbourne for assay. Two picked samples assayed 3 ozs. 23 grs. and 1 oz. 12 dwts. 6 grs. gold per ton respectively, and a sample of 48 lbs., treated at Messrs. Parker and Co.'s works as Footscray, yielded at the rate of 10 dwts. 13 grs. free gold per ton. A bulk sample of about one ton yielded at the rate of 5½ dwts. free gold per ton.

Iron and copper pyrites occur irregularly distributed through the quartz, and gold is said to have been seen in the stone in the last few feet of sinking; but a sample which I took across the reef near the bottom of the shaft and sent to Mr. Ward, Government Analyst, contained no gold. Of course, however, a better idea can be obtained of the true value of the stone from a bulk sample than from a sample of five or six pounds such as I took, as gold is invariably very unevenly distributed through the stone.

The reef cannot be traced on the surface, owing to the covering of angular *débris*. On the western side of the ridge, about 150 feet vertically below the mouth of the shaft, a tunnel has been driven about 350 feet. This starts in a north-westerly direction, but has been turned considerably towards the west, and in the end is running a little west of north. The country passed through consists chiefly of compact mudstone and sandstone with several bands of porphyry, the last one passed through near the end of the tunnel being about 10 feet thick, standing almost vertical and striking approximately north and south. Had the tunnel been kept on its original course the distance driven would probably have intersected the line of the reef, and something definite would have been known as to whether the reef lived or not. I am of opinion that it is a contraction fissure and likely to be confined to the porphyry. The simplest way to prove this would be to drive both ways from the bottom of the shaft, which, however, is far too small for a working shaft. I would strongly advise that a trial lot of at least 20 tons of stone be sent away for a bulk test. With the natural facilities that exist for economic mining, and the easy accessibility to the mine, a yield of half an ounce of gold to the ton should pay all expenses.

Mount Mary Mine.—Gold has also been found south of Lovett on private property, just outside the town boundary, and some prospecting has been done by a local syndicate. The gold-bearing rock is generally fine-grained to compact, but in parts numerous rounded and sub-angular fragments of quartz, slate, &c. can be seen, which leave no doubt as to its fragmental character. The main mass is probably a very fine volcanic ash or tuff. The outcrop of the formation is on a ridge running S.W. from the township of Lovett at an elevation of about 400 feet above sea level. A hole has here been sunk about 9 feet, the formation being about 3 feet wide, striking E.N.E., and dipping to the N.N.W. at an angle of about 55°. A good deal of the rock is stained red from disseminated hematite, and there are numerous fine cracks filled with brown oxide of iron. On breaking some of the stuff thrown out from the hole I found fine specks of gold in several pieces, and a rough sample of some of the most likely looking pieces which I sent to Mr. Ward contained 4 dwts. 2 grs. gold per ton. About 25 feet W.N.W. from this hole a vertical prospecting shaft was sunk, which passed through the formation, and from the bottom, about 60 feet from the surface, a crosscut to the N.W. intersected it in about 16 feet. It is here about 4 feet wide, with about the same strike and dip as at the surface, but it is much broken, the joints being faced with kaolin, probably due to the decomposition of the felspar of the tuff. I took a sample from different parts across the whole width exposed, but this showed, on assay, only traces of gold; a previous sample from here is said to have assayed 2 dwts. 7 grs. of gold per ton. The country passed through in the shaft and crosscut is mudstone, containing occasionally rounded pebbles. A larger shaft has now been started about 20 feet further west, but had not cut the formation at the time of my visit. Possibly, in driving along the course of the formation richer patches of gold-bearing stone may be met with, but I see no reason for supposing that the average gold contents will increase with depth, and the prospects do not seem to me to be sufficient to warrant spending much more money on it.

Most of the surrounding land is freehold, but a short distance to the S.W. is an 80-acre block of Crown Land, and on this a ten-acre Section, No. 1306-93 G, locally known as Murphy's Section, has been taken up for gold. A little below the track from Port Cygnet, near the northern boundary of the section, at an elevation of about 750 feet above sea level, is a bold outcrop, which, from a distance, resembles the outcrop of a quartz reef, but a closer examination shows it to be a compact whitish rock containing porphyritic crystals of sanidin, with pyrites finely disseminated through the ground mass.

Two or three chains further south a hole has been sunk about 9 feet, now half full of water, from which a little gold is said to have been obtained. The stuff broken out consists of reddish siliceous rock, with blebs of glassy quartz, and occasional crystals of felspar. Some pieces are curiously streaked with fine parallel lines of white and red, and the whole has a somewhat brecciated appearance. It is probably a dyke which has partially fused together fragments of the country through which it burst. In some parts it is traversed by thin veins filled with chalcedony or opal, due to hydrothermal action. A little further S.W. a deep trench has been cut through an outcrop of fine-grained porphyry, containing a little pyrites, but, so far as can be seen, nothing of any value.

Martin's Show.—About a mile south of Murphy's Section, on freehold property standing in the name of Richard Lewis, a little trenching has been done on what is known as Martin's Show. This is a dyke formation, striking about N. and S. and dipping W., but its full width is not seen. The porphyry has been considerably altered by hydrothermal action, and is seamed with small veins of opal. In places there is a good deal of marcasite, or white iron pyrites, and one specimen I brought away contained pyromophite (phosphate of lead). This dyke has, I believe, been traced for a considerable distance, but the surface is now much overgrown with thick scrub. It deserves further prospecting.

Alluvial Gold.

A little alluvial gold has been found in several of the gullies near Port Cygnet, and at Lymington some rich patches were obtained, but they were of small extent. A company was formed some years ago to work on private property belonging to Mr. Coad; a small dam was made and a long tail-race fluming built, but the latter is not low enough, and the water supply seems to have been very poor. I have been unable to obtain particulars of the amount of gold won, but I was informed that the company nearly paid expenses for about two years, when work was abandoned, and all the old prospecting holes have since been filled in. I was shown a sample of about 10 ozs. of coarse shotty gold obtained from a small paddock on Mr. Coad's farm, and several dishes of the surface stuff washed in my presence all showed a few fine colours of gold. Probably systematic prospecting along Forster's Rivulet would reveal richer patches, but all the land is freehold property, and there does not seem to me to be sufficient inducement to warrant the destruction of the apple orchards and beds of raspberry canes which this would necessitate.

It is probable that the gold exists disseminated through the trachytic porphyries (of which the surrounding hills are largely composed), rather than in true reefs, and by the long continued wearing down of these it has been concentrated in the alluvial, but there is no reason to suppose that it exists in payable quantities in the parent rock. I take this opportunity of thanking Mr. Cranny, who very kindly acted as my guide at Lymington.

Concluding Remarks.

The great Mount Morgan Mine is stated by Mr. R. L. Jack, Government Geologist for Queensland, to lie in an area of permo-carboniferous rocks traversed by a series of basic igneous dykes; and in the United States and various other parts of the world considerable quantities of gold have been obtained in rocks of this or later age, generally associated with andesites, trachytes, and other volcanic rocks, so that, although no payable lodes have hitherto been discovered in the permo-carboniferous or younger rocks in Tasmania, there is no inherent impossibility of their occurring. In the present case, however, I am afraid the gold only occurs in sufficient quantities to induce money to be spent in search for more, without much prospect of ultimate success.

NOTE ON THE REPORTED DISCOVERY OF GOLD NEAR HOBART.

On my return from Port Cygnet I visited the so-called gold mine on Mount Wellington, and have now the honour to submit the following brief notes thereon:—

The scene of operations is on an extended prospecting area of 25 acres adjoining Regan's estate, the workings being situated close to the Sandy Bay Rivulet, about a mile above the Hobart Waterworks Reservoir. An inclined shaft has been sunk about 90 feet, and from the bottom a drive put in 30 feet to the south. Some years ago a shaft was sunk about 75 feet, and it is said that good assays were obtained for gold, silver, and cobalt, but I could see no sign of any lode or other formation likely to carry valuable minerals. The present shaft was sunk through the old ground for about 35 feet, when it was turned a little to the south to get into the solid country and continued along the dip of the strata. On the footwall side is a bed of black shale, the full thickness of which is not seen, but it is said to be 4 feet thick, and the manager informed me that in putting in some timber in the drives he had come on to limestone underlaying the shale. Above this is a somewhat gritty sandstone with occasional patches of quartz conglomerate, the general strike being about N. and S., with a varying but rather flat dip to the east. No fossils were seen here, but a little higher up the creek are the remains of an old lime-kiln, and the fragments of calcareous mudstone lying about are full of remains of typical *Permo-carboniferous* fossils, amongst which I recognised the following forms:—Spirifera, Strophalosia, Terebratula, Productus, Aviculopecten, Fenestella, &c.

Disseminated through the sandstone are numerous minute garnets, and for a thickness of about two feet there is a good deal of iron pyrites, such as is very frequently met with in the Coal Measures all over the world. A sample of this from the drive was assayed by Mr. Ward, who found it to contain nothing of value, and I cannot see the slightest reason for expecting that any improvement will take place either in driving or sinking. In my opinion it is simply waste of money to continue mining operations here.

I have the honour to be,
Sir,
Your obedient Servant,

J. HARCOURT SMITH, *B.A.*, *Government Geologist.*

W. H. Wallace, *Esq.*, *Secretary for Mines, Hobart.*

SUPPLEMENTARY NOTE ON LIMURITE IN TASMANIA.

BY W. H. TWELVETREES, F.G.S., AND W. F. PETTERD, C.M.Z.S.

paper the authors refer to their Note on the same esented to the Society last year, since when they rther examined it microscopically, and have studied rrence on the spot. They acknowledge their in- ness to Mr. R. Williams, the Manager of the Cole- for many useful and interesting specimens. The s between Rosebery and Ringville, on the saddle of bout 1500 ft. above sea-level, and is remarkable for antity of pyrrhotite occurring in the rock, associated opper pyrites in relatively small quantities. The s do not regard the occurrence as a lode, but rather ck mass, in the form of an irregular dyke or intru- Generally, the country to the west is serpentine, the east slates; and the rock in question has been ed along or near the line of contact, though at the the ridge it appears to have come up through the in several branches or bodies, leaving horses of morphic slate standing in its mass. Viewing the rock ass, it is composed of augite (altered largely to uralite tinolite), axinite, calcite, datholite, danburite, with lary chlorite and sphene. Essentially it is an ultra- rock (pyroxenite), which here and there receives the on of other boric minerals and then becomes limurite, posite rock, consisting practically of augite and e. How were the boric emanations introduced? they escapes from a neighbouring acid basin? That was an acid reservoir not far off is shown by the tourmaline quartz porphyry at the Renison Bell Mine, and by the axinite quartz veins found on the West Coast Prospecting Association Section, and by the granite near the latter. A slide prepared from this vein-rock is referred to, and mention made of the association of tourmaline with axinite in other parts of the world. The authors arrive at the conclusion that the West Coast granite, or its elvan dykes, consolidated at the same time as the limurite dyke at the Colebrook. The action of boron vapours in the granite area to the west is shown by the tourmaline and axinite just alluded to, and if these vapours extended to the pyroxenic magma at the Colebrook, and were carried up with it, the origin of the limurite rock would be accounted for. Last year a Note on Datholite was submitted by Mr. W. F. Petterd, and now the authors state the results of a microscopical examination of this mineral. Another new mineral is added to the list of the components of this singular rock, viz., the boro-calcium silicate, danburite, and its microscopical characters are enumerated. A further mineral with characters suggestive of its being a precipitate from a boric solution is mentioned. It is somewhat similar to the decomposition product of boracite known as parasite, a hydrous magnesian borate. The authors consider that the limurite rock throws light on the question of the age of the granite on the West Coast, as the Colebrook intrusion appears to be younger than the serpentinous and gabbroid rocks to the west of the mine.

HAÜYNE-TRACHYTE AND ALLIED ROCKS IN THE DISTRICTS OF PORT CYGNET AND OYSTER COVE.

BY W. H. TWELVETREES, F.G.S., AND W. F. PETTERD, C.M.Z.S.

ieous rock at Port Cygnet, in Southern Tasmania, a known for a long time by the name of felspar-y. As the porphyritic crystals of felspar are strikingly displayed in the rock, specimens have id again, through collectors, found their way to it parts of the Colony. Microscopical study of these samples made us aware that the handsome ries were soda-trachytes, and we classed them as our last year's sketch of the igneous petrology of ia.* Since then we have found the felspathoid l haüyne or nosean in them, which confirms our is determination, and a recent excursion to the has enabled us to recognise quite a group of these is well as to fix their geological age.

country round Lovett and Lymington furnishes sections which may be used by the geologist, but the most valuable of these is, perhaps, that which ded by the Livingstone mine. The mine shaft and gs are on the crest of a hill, 600 feet above sea- about two miles N.E. of the township of Lovett. fore reaching the crest the trachyte may be seen in ad-cutting underlying the sandstones and slaty ous beds which form a large portion of the hill. saddle there are some fossiliferous beds of the -Carboniferous System, charged with spirifera and llidae, and a little higher the trachyte appears

In one form here it has a slabby habit, due to its argely composed of parallel layers of large tabular s of orthoclase felspar, some of which measure as as two inches in length. The Livingstone mine s close by, and appears to be sunk in banded e and quartz. One hundred and fifty feet below unnel has been driven for 360 feet, passing through -Carboniferous sedimentary beds, and intersecting

bands of trachyte in its course. First it cuts a layer; subsequently a 2 ft. band of the coarse ritic trachyte seen at surface (the miners' name for " magpie "), and near the end of the drive 12 to 15 white trachyte rock is passed through, called e " by the miners, and referred to under that name published reports of the company. It is important that these bands or lava sheets are conformable ie sedimentary strata, and we cannot entertain any of their geological contemporaneity. In this hill, ie entire region, considerable variety exists in the nt flows of these trachytes. Some are coarse in , others are fine-grained and compact. Some of have their counterparts on the Mount Mary Hill on the west side of Lovett. In particular the slabby te, distinguished by its large tabular felspars pie ") is found again at the Mount Mary mine on estern side of the valley, only there it is much posed, and has an abundant development of epidote. Mount Mary trachytes may be seen cropping out in arry on the hillside in front of Harvey's Hotel at , where they have been used for road metalling and ig purposes. At least two varieties are distinguish- the quarry face—one a tough dense speckled rock, the other a smooth porphyritic, somewhat fissile, stone of a light bluish-grey hue, suggestive of a sodic lava. The compact type contains a fair amount of epidote. Passing up the hill to the west the rising ground above Mount Mary mine exposes outcrops of several varieties of trachytic rocks, which continue right through the hill to the Lymington-Wattle Grove Road. Opposite Martin's cottage on that road is a bold outcrop of a rather plutonic-looking grey hornblendic rock, at first sight much resembling syenite, but which on microscopical examination we found to be an undoubted trachyte, with beautifully zoned felspars.

There are good exposures of sections on the beach between Lovett and Lymington, where the beds are lying rather flat. On this beach we found additional evidence of the contemporaneity of the trachyte with the Permo-Carboniferous sediments. We discovered some fresh syenite (augite-syenite) along this line, and specimens of a similar rock and of an intrusive micaceous trachyte have since been given us by the Government Geologist (Mr. J. Harcourt Smith, B.A.), who collected them from the shore at low-water, just south of the Lovett regatta-ground. A very remarkable dioritic rock occurs on Mr. Patrick Cranny's property at Lymington. It consists of hornblende + plagioclase felspar, with the hornblende greatly preponderating. We have placed this dark basaltic looking rock among the dioritic aplites called malchite.

That this petrographical province extends further north we have satisfied ourselves by the discovery of blocks of garnetiferous trachyte at the base of the Sugar-loaf Hill, behind Mrs. Cleary's cottage on the road to Cradoc. It is there also associated with Permo-Carboniferous fossiliferous marine beds. It is well known, moreover, that it extends to Oyster Cove in a N.E. direction.

The word " felspar-porphyry " was applied to the Port Cygnet rocks as a field term, indicating a porphyritic texture. It meant simply that the uniformity of the micro-crystalline ground-mass is interrupted by a profusion of larger crystals which were formed during the intra-telluric period of the history of the rock. The term is only admissible as a temporary expedient for the designation of such rocks prior to definitive examination. It can be discontinued now that the trachytic nature of these rocks is beyond doubt.

It may be useful to trace the lines along which our enquiry has travelled, and show how they lead up to the results now submitted.

As a rule, when the colors are white, yellow, grey, we may take it that a lava does not belong to the basic series of rocks. It will be a member either of the acid series, containing over 66 per cent. silica, or of the intermediate series with 55 per cent. to 66 per cent. As a whole, the Port Cygnet rocks are remarkable for the small quantity of their free silica. They are essentially quartzless rocks. Of course they contain silica in combination, but only sufficient to bring up the SiO_2 per cent. to the limit for intermediate rocks, those lying between the acid granites and rhyolites and the basic gabbros, dolerites, and basalts. The silica per cent. corresponds with the specific gravity, which averages 2·5 to 2·6. These facts help us in locating

Trans. Aust. Inst. Mining Engineers, 1898, Vol. V., p 108.

the rock in a definite division. Now, in this division the andesites and diorites are characterised by plagioclase felspars, while in the trachytes and syenites orthoclase is dominant. In the Port Cygnet rocks orthoclase unquestionably predominates. Trachyte is the volcanic form, syenite the plutonic.

Haüy first gave the name of trachyte (τραχίς = rough) to volcanic rocks feeling rough to the touch. In these rocks there is generally very little glass, the ground-mass being more or less crystalline. When they contain plagioclastic felspar it is an acid variety. When this felspar increases in quantity, and grows more basic, we are led to the andesites; and it is not always easy to understand the meaning of the term trachyte as used by some authors, who extend it in the direction of the andesites till it becomes useless for the purpose of classification. In this connection we cannot do better than bear in mind Rosenbusch's definition of trachyte as implying the dominant presence of a potash felspar and the absence of quartz among the porphyritic constituents. He says :—

"The trachytes are neo-volcanic effusive rocks which may be designated equivalents of the syenitic plutonic rocks and of the palæo-volcanic quartzless porphyries in all their modifications."*

The only modification which we would venture to make in this admirable description would be to include palaeo-volcanic rocks in the trachyte group. Some carboniferous trachytes have been found in Britain, but these have been ranked by the illustrious author just named among "orthophyres" or "quartzless porphyries having completely the habit of trachytes." We cannot see, apart from the question of age, that anything would be gained by calling the Port Cygnet lavas, orthophyres. Many of the felspars are brilliant to the eye and pellucid in thin section. On the other hand, some of them have lost their glassy appearance and acquired a yellowish opaque aspect, sometimes, however, retaining a vitreous interior, to which the peripheral decomposition has not extended. We seem here to have intermediate stages between glassy sanidine and opaque orthoclase. No doubt, the mineralogist would deny the term sanidine to these opaque crystals and call them orthoclase. Of course, those who postulate sanidine as an essential constituent of trachyte will have to call some of these rocks trachytic orthophyres, and reserve trachyte as the name for the varieties with glassy orthoclase. But this seems to us a needless multiplication of classes, and we anticipate that the sanidine variety of orthoclase will not always be regarded as an essential ingredient of trachyte, nor will the name trachyte be confined to rocks of Tertiary age solely.

Assuming, then, that we are now dealing with the trachytic group, we take a further step and define these volcanic rocks as soda trachytes. This is shown by the presence of one or more of the soda minerals, haüyne, analcime, aegirine, aegirine-augite, cataphoritic hornblende, and the green pleochroic augite rich in the acmite molecule ($Na\ Fe\ Si_2\ O_6$). Such trachytes are very closely allied to phonolites, and become phonolite by the addition of either of the felspathoids, leucite or nepheline. The roughness of ordinary trachytes is characteristically absent, and the disposition of felspar crystals in layers is a marked feature, imparting a certain degree of fissility to the rock. The rock has evidently possessed in its molten state exceptional viscosity, which has impeded free flow and caused crowding of the porphyritic elements. This, again, is not unknown among phonolitic trachytes and phonolites.† The presence of haüyne is considered by some authors sufficient to remove a rock from the t to the phonolytes, and they would call some of t Cygnet rocks phonolytes. It is interesting to note nosean (haüyne) in the first British phonolite (Wo Cornwall) was discovered by Mr. Allport, in 1 means of the microscope, the same instrument ha the discovery of haüyne and phonolitic trachytes Cygnet.

Though the eruptive rocks of this province are e products of one and the same magma, yet differe at different times show varieties of mineral compo all probability characteristic of each eruption, in to which there are structural differences depende the physical conditions of consolidation. We a more or less plainly, to arrange the numerous provisionally, as follows :—

Effusives— SODA TRACHYTE GROUP.
- Haüyne Trachyte, with porphyritic haüyne.
- Aegirine Trachyte, with aegirine needles and aegirin
- Melanite Trachyte, with abundant melanite-garnet.
- Trachyte, with green sodic augite.

These comprise various types, described in detail furth

Intrusives— SODA APLITE GROUP.
- Sanidine-augite-haüyne Aplite.
- Sanidine-augite-biotite Aplite.
- Malchite or dyke-Diorite, (an aberrant member).

Plutonics— SODA SYENITE GROUP.
- Alkali-augite-Syenite, with micro-perthite and analc
- Alkali-augite-Syenite, with elaeolite, (Little Oyster

The minerals which we have detected in thes may be enumerated as follows :—

	Trachyte.	Aplite.	Syeni
Essential —	Orthoclase (Sanidine)	Orthoclase (Sanidine)	Orthocla
	Oligoclase	Augite	Microper
	Augite	Biotite	Albite
	Hornblende		Elaeolite
			Augite
			Hornble
Accessory —	Haüyne	Haüyne	
	Aegirine	Apatite	Melanite
	Melanite-Garnet	Sphene	Biotite
	Biotite	Zircon	Apatite
	Apatite		Sphene
	Sphene		Zircon
	Zircon		
	Magnetite		
Secondary—	Analcime	Natrolite	Analcime
	Epidote	Opal	
	Quartz	Quartz	
	Natrolite		
	Actinolite		
	Muscovite		
	Pyrites		
	Limonite		
	Chlorite		
	Clinochlore		

ALKALI SYENITE (AUGITE SYENITE).

Sp. gr. 2·6.

Found *in situ* on beach south of Regatta Ground, Port Cyg massive exposure, but lying at the water-level.

Macroscopic characters.

Medium grain; brownish grey, syenitic lookin an elaeolitic appearance, with greasy feel. With ritic tendency by reason of a few large glistening (nearly ½" long) scattered sparingly. No rhomb sections of felspars seen. Numerous small brilliar garnets appear as specks, which can be well rec with the pocket-lens; many of these seem enclose felspars. The rock resists decay well, as shown thinness of the weathered crust, decomposition not ing far into the interior of the stone.

* Mik. Phys. d. massigen Gesteine, 1896. p. 738.

† "We find that acid lavas are very decidedly less mobile than basic ones, and so flow less readily and to smaller distances; and, further, that certain intermediate lavas, rich in alumina and potash, are remarkably viscous, as is illustrated by the peculiar dome-like forms assumed by some trachytic and phonolitic eruptions." Daubrée "believes that some trachytic domes must have been erupted in a nearly solid, not even pasty, condition." Nat. Hist. of Igneous Rocks. A. Harker, Sc. Prog. Vol. VII. pp. 204–6.

Microscopic characters.

cture, normal hypidiomorphic-granular (granitic), n occasional leaning to the trachytic type by an rphic columnar felspar here and there. It is essen- potash-felspar rock, but there is very little proper lase in it, for the orthoclase is intergrown perthiti- or rather micro-perthitically with striped felspar, howing very fine striae indeed, giving the extinction of oligoclase or oligoclase-albite. These twinning- re generally short, not continuous, and are sometimes ipted by similar sets at right-angles. Here and n the slide is water-clear albite, pellucid as quartz; art from this, and an exceptionally clear crystal or orthoclase, the felspars are turbid.

ie analcime in the felspars points to the former ce of elaeolite, and its existence may be suspected, i we cannot optically demonstrate it.

important feature is the garnet, which is very plenti- i brown irregular grains and ill-formed crystals, ; a corroded appearance. These are characteristically rown or associated with augite, biotite, and apatite, i their neighbourhood is often seen a yellowish arent flaky or zeolitic-looking mineral, with low ive index, and giving in polarised light the appear- f a soda decomposition product. The abundance of warns us that the rock is allied to the elaeolite- es.

re is some grass-green augite (malacolite) in granular lar forms. It has slight pleochroism, and where il sections could be found they gave extinction of 33° and 34°. The mineral is often bleached in iterior. Besides being specially intergrown with , it is associated occasionally with dark green horn- e. This hornblende is intensely absorptive. Its iroism is a = yellowish-green, c = very dark green. direction could not be ascertained. A little light i idiomorphic mica gave a = light greenish-yellow, ark dirty green. Zircon, present in all syenites, in small quantity, likewise a little sphene in ited wedges. Very little quartz can be definitely ised.

s syenite cannot be considered quite identical with those syenites, rich in alkali, which Rosenbusch has l into types under the names (after J. F. Williams) cite, Albany, and (after Brögger) Laurvikite types; is evidently related to these and to their allies, the te-syenites. The syenites which are known in other of Tasmania have quite other relationships, being closely connected with the granite family.

Augite Syenite.

nd *in situ* on beach between Regatta Ground and Lymington.

Macroscopic characters.

e-grained, with numerous lustrous faces of felspars, ecked with green augite. Some of the felspars are orphic. Colour of the rock light grey.

Microscopic characters.

icture, hypidiomorphic-granular, many of the fel- strongly idiomorphic parallel to 001 and 010. A f these much larger than the rest, with numerous ures of sphene and small felspar crystals. Zoning of rs quite a feature. Many of the orthoclase felspars assy, and have a sanidine habit. There is a good deal ite-twinned felspar and microperthitic intergrowth of -oligoclase with orthoclase, some of the twinning extremely fine, and cross-twinning is well shown. xtinction angles yielded by different crystals seem to se of both albite and oligoclase.

ale green augite (malacolite) is frequent. Its pleo- m is very slight. Its extinction angle in the prism s as high as 44°. Wedge-shaped crystals and grains of sphene plentiful. A little idiomorphic apatite and interstitial quartz. We have not noticed any garnet in this syenite.

Haüyne Aplite.

Sp. gr. 2·75.

Found at Port Cygnet, but the precise locality is unknown.

Macroscopical characters.

A medium-grained dark grey rock, consisting largely of small columnar and tabular sanidine crystals, some of which exceed the rest in size. A parallel arrangement of felspars occurs, but is inconstant, the crystals lying mostly in all azimuths. With a hand-magnifier granular augite seems plentiful, and crystals of yellow sphene are seen here and there. Small grey and white spots represent nosean, but this mineral can only be identified microscopically.

Microscopical characters.

The rock is seen to be essentially composed of sanidine, augite, and nosean, with the minerals sphene, apatite, and zircon as accessories. The sanidine is clear, and mostly in columnar forms, with Carlsbad twinning. Some of these prisms have been dynamically bent. They carry abundant inclusions of haüyne (nosean) decomposed to zeolitic matter of a light yellow colour, giving mottled grey and white interference appearances under crossed nicols. Augite is in prismatic elongated forms, and is a green pleochroic variety with extinction angle of 40°, though as the colour becomes yellowish the angle seems to decrease. a = light green, c = dark green. Bleaching is common. Grains and rods of augite border crystals of apatite. Large decomposed haüyne crystals are abundant as divergent and fan-shaped zeolites of a pale yellow colour in plain light. Allotriomorphic orthoclase felspar forms a cement uniting the above elements, and this gives the aplitic character to the rock. Yellow crystals of sphene in prismatic and acute rhombic sections are plentiful. Zircon is less common; magnetite in grains.

Soda Aplite, a Sanidine-Augite-Mica Dyke Rock.

Sp. gr. 2·85.

Locality—On the beach at Port Cygnet, south of the Regatta Ground.

Macroscopical characters.

A hard granular dark glistening rock resembling a minette (mica-trap). Numerous little brilliant faces of dark mica visible. The felspar looks granular and sugary. The green augite is too minute for satisfactory identification.

Mineral constituents.

Sanidine, augite, biotite, apatite, soda decomposition products and pyrite.

Microscopical characters.

The first thing which strikes one on looking at a slide is the panidiomorphic structure of the rock, reminding one at once of aplite. At the same time the prisms of augite and plates of mica follow linear directions like the minerals of a foliated rock.

The felspar is granular and imperfectly prismatic, with its boundaries abridged by neighbouring prisms. Carlsbad twinning is frequent. Where elongated sections are available with some approach to a prismatic character, the extinction is straight. The crystals are pellucid and contain numerous microliths, rods, ovoid and circular grains perfectly transparent, colourless, and without any definite action on polarised light. Some are light green; these are augite. The inclusions, which are of large size, are a constant feature.

The augite seems to be diopside, of a dirty green colour with an occasional disposition to bleach. It is in ill-formed prisms, without perfect terminations. Its extinction angle is about 40°, and it often has perceptible

pleochroism. Augite grains, too, are numerous, and large nests or agglomerations of granular augite occur.

The third constituent in order of frequency is a yellowish-brown biotite with strong basal cleavages, showing in sections perpendicular thereto. Rays vibrating parallel to **a** undergo least absorption, **c** being opaque-brown, and **a** yellowish-brown. There is a little apatite in stout short prisms and large irregular grains. Some decomposition material similar to the yellow products after haüyne is present. The rock contains neither quartz nor hornblende, and is altogether an unusual one. We do not know of any similar occurrence with which it can be compared. It appears to belong to the group of aplitic dyke rocks (Rosenbusch), but the absence of aegirine and the abundance of a high-angled augite shut it out from the tinguaitic set. Still, we feel tolerably certain that its place is in the soda-trachyte series, and among the dyke rocks in that series.

HAÜYNE-TRACHYTE.

Sp. gr. 2·55.

Occurs near the shaft on hill at Livingstone Mine, near Lovett.

Macroscopical characters.

A bluish-grey porphyritic rock with crowded layers of glistening tabular sanidine felspars. The smaller porphyritic elements are hornblende, augite, brilliant dark garnets, and numerous soft white sections of haüyne. This is the only rock which we have found with comparatively fresh or unaltered haüyne (nosean).

Microscopical characters.

The felspars are clear in section. The fragments in the slides are generally too imperfect for reference to particular zones. The orthoclase is much intergrown with oligoclase: there are fragmentary sections of Carlsbad twins with albite twinning on one half, sometimes with a cross striation. Partial twinning frequent in orthoclase crystals, but sometimes very faintly visible. Some felspars seem to have been enlarged by a subsequent addition of material, which surrounds the original crystals as a fringe. This must have taken place prior to the final consolidation of the rock.

Garnet.—This is plentiful. When it occurs in such rocks it is usually referred to the variety of calcium-iron garnet known as melanite. It is in forms of the trapezohedron and dodecahedron, and sometimes zoned. In thin section the colour is yellowish to reddish brown. Its sections are margined brown, and traversed by irregular iron-marked fissures. It is quite common to find it intergrown with and enclosing crystals of hornblende and augite.

Haüyne (Nosean).—This mineral is abundant, and gives sections approximating to faces of the cube (100), dodecahedron (110), and trapezohedron (211). Hexagonal sections are common; no trigonal ones. Rounded grains very frequent, and crystals with a mutilated and corroded appearance. The mineral is sometimes colourless, but generally characterised by a soft slate-grey tint in the peripheral parts, shading off towards the interior. The colour is deepest at the border. Dark striae are often seen proceeding from the faces inwards, sometimes in sets at intersecting angles. There is none of the blue tint which is seen in some haüynes. The interiors are full of granular microlites; nearly all are undergoing decomposition into natrolite or other soda products represented by divergent scaly aggregates. Crystals of haüyne are often enclosed in the large felspars.

Nosean and haüyne are classed together by Rosenbusch under the group name haüyne. They are both silicates of alumina and soda, but in the haüyne there is the addition of lime. Dana* gives the percentage composition two minerals as under :—

	Silica.	Sulphur trioxide.	Alumina.	Lime.	Soda.
Haüyne...	32	14·2	27·2	10·3	16·6 =
Nosean ...	31 7	14·1	26·9	—	27·3 =

Haüyne often has a blue tint. Where this tint is and no lime separates out during decomposition impossible to distinguish the two optically. Thes have to be borne in mind when considering a references to either of these two minerals.

Hornblende.—This is a somewhat peculiar varie has the black colour of arfvedsonite to the eye, deep green, sometimes nearly opaque in thin secti the section is at all thick it is opaque. The pleochr strong. **a** = yellowish green; **b** = very dark sometimes opaque; **c** = very dark green, som opaque. This absorption scheme **c** ≥ **b** > **a** agree that of common green hornblende, and not with t arfvedsonite, which is **a** > **b** > **c**. But the st opacity suggests something out of the common, some sections the absorption varies to **b** > **c** > **a**, characterises the black alkali-iron hornblende of phonolitic trachytes and linguaites which Brögg called cataphorite. It seems to us possible that th blende is of a cataphoritic nature, though its exti angle is rather low for that species. $c : c = 14°$ whereas in cataphorite it varies from 23° to 60°.

A bright green slightly pleochroic augite occ prisms and grains. $c : c = 34°$ or thereabouts. in grains. The groundmass consists of small s prisms in fluxional arrangement, interspersed wit grains of augite. The whole is rather obscured composition.

Tertiary haüyne-trachytes occur in France (Auv haüyne-phonolites in Germany, Portugal, the C Colorado; the nosean-phonolite of the Wolf Rock, wall, is the nearest related rock in Britain.

HAÜYNE-TRACHYTE.

Found on the crest of the Livingstone Hill, and in the mine tu feet below. Also in the trench at Mount Mary Mine, west o

Macroscopical characters.

A soft light grey rock, easily recognised by it tabular orthoclase felspars lying thickly in parallel causing the rock to split more easily in that di These felspars are mostly between ¾″ and 1½″ in and from ⅛″ to ¼″ thick, and can be often chipp from the matrix, making good specimens for the They are tabular ‖ 010, and the cleavage parallel plane is perfect. The crystals are opaque externall yellow, but occasionally the interior is glassy, sa like. Mr. Frank Rutley has aptly described them having a biscuit-like appearance. The miners c rock "magpie." The only other pronounced macros element is limonite in hexagonal and other section some cubic mineral, probably garnet. The sam occurs at the Mount Mary Mine, where it is more posed, and contains much epidote.

Microscopical characters.

The orthoclase is often intergrown with a striped It encloses numerous hexagonal and other sect haüyne, replaced by liebenerite (?). The rock is porphyritic pseudomorphs of liebenerite (?) ag after haüyne in rectangular and rounded sections.

Sharply defined sections of a cubic mineral deco to limonite are plentiful. The determination original mineral is difficult, as we have not much the forms to guide us.

* System of Mineralogy, 1898, pp. 431-2.

says*—"Garnets containing ferrous iron often rusty and disintegrated through the oxidation of ı, and sometimes are altered more or less completely ıite, magnetite, or hematite." In one of our sections ·cted a crystal of melanite-garnet undergoing this . but we have not been able to discover any further es of partial change. Haüyne also suffers a somemilar change, and the choice here appears to be ı the two minerals, haüyne and garnet, with probastronger in favour of the latter.

groundmass is rather obscure, but appears to conprisms of straight extinction felspar. Iron ore in grains.

Haüyne-Trachyte.

is another trachyte from the top of the Livingstone It is a grey rock, with the faint bluish tinge, which Port Cygnet trachytes we have found associated ıe presence of haüyne. Groundmass compact lava-ıith numerous porphyritic crystals of dull white ase ¼″ to ½″ in length. These crystals are tabular in The other visible porphyritic constituent is the te to which we have alluded above as being probably morphous after melanite-garnet. This is in hex- and other familiar sections of the isometric system.

Mineral constituents.

oclase : secondary limonite, muscovite, iron oxide.

Microscopical characters.

large orthoclase crystals are turbid, and enclose nal sections of nosean, now replaced by micaceous ıtes in confused flakes, polarising in the vivid , of the second order. These remind one of the ary muscovite (liebenerite) in liebenerite-porphyry. d with them is a mineral giving soft grey inter- tints, and this may be natrolite. The same aggre-ıre frequent throughout the rock, filling up the rs of the porphyritic haüyne (nosean) crystals which reserved their characteristic contours. The ground- much decomposed, but seems to consist essentially ll sanidines. Numerous black needles obscured by may represent acmite or aegirine.

Aegirine-Trachyte.

Sp. gr. 2·61.

e are two or three varieties of trachyte, with needles soda-pyroxene aegirine entering largely into the ıition of the groundmass. The most striking of s a greenish rock, markedly porphyritic and fissile ıon of parallel layers of tabular sanidine crystals, on the beach at Port Cygnet south of the Regatta l. The only other porphyritic mineral is augite. ıtes of sanidine lie preponderatingly in one direction rs, giving rise to divisional planes, along which the eaves more easily than in a direction perpendicular

Microscopical characters.

ısions of minute needles of augite (or aegirine) are ıtly arranged in zonal form round the periphery of idines, and the margins of the large felspars often nperceptibly into the groundmass, the magma of has apparently corroded them. A crop of microlites l along these imperfect edges. The sanidines are nd enclose crystals and fragments of augite, besides able microlites and glass inclusions.

ite.—Sections in the zone of 001 and 100 are n.

colour of these porphyritic pyroxenes is a rather een ; they are distinctly pleochroic. The extincgles are very variable, and the character of extinc-undulose, probably in consequence of mixtures of normal and soda pyroxene. The extinction of the central portion of a crystal will be 38°, while that of the margin will be straight or nearly so. Sometimes a crystal is found extinguishing at about 5° or 6° in one direction, with a pale yellowish fringe extinguishing at the same angle in the opposite direction. Inserting the quartz wedge with its axis of least elasticity covering the elasticity axis of the pyroxene nearest to the vertical crystallographic axis of the latter, we notice that the colour falls till it is replaced by darkness. In petrographical language, compensation has set in. By this we know that the axis of elasticity in the two crystals (the quartz and the augite) are dissimilar. As the direction in question is that of least elasticity in the quartz, it follows that it is that of greatest elasticity in the pyroxene. This is an important optical test for distinguishing soda pyroxene from normal augite. The groundmass is a remarkable feature of the rock. Small laths of sanidine, often with fluxional arrangement, form a ground-work, with which are entangled pale green rods and needles of the soda-pyroxene aegirine. These are slightly pleochroic, and might be mistaken for augite, but that they uniformly extinguish nearly parallel to their long axis, which direction of extinction the quartz wedge shows to be that of the **a** axis of optical elasticity. The rods are sometimes acicular at one or both extremities, sometimes curved. They occasionally attach themselves end on like a fringe to the borders of crystals of augite. They call to mind the aegirine needles in the aegirine- (formerly called acmite-) trachyte of the Kühlsbrunnen in the Siebengebirge.

In one of our slides is an equilateral hexagonal section of a small water clear mineral in the groundmass, greatly resembling a section of nepheline ; but it is not perfectly isotropic between crossed nicols, and we have failed to obtain a dark cross in convergent polarised light. It has peripheral and central inclusions of colourless to pale green pyroxenic microlites. It has no border such as is common in noseans. If it is nepheline, it would remove our rock from the trachyte to the phonolites ; for the present we must leave the determination doubtful. In the groundmass there is a good deal of isotropic zeolitic matter, apparently of the nature of analcime.

Another variety of the same rock is found on Mount Mary, just above the mine. There it is a compact green rock, often laminated, strongly resembling a metamorphic rock. A few isolated scattered crystals of sanidine occur in it, together with an occasional small black garnet. Under the microscope we see that the green colour is due to the felted network of aegirine needles, and that the rock is essentially identical with the one just described, only with the porphyritic felspars reduced to a minimum. The garnet is the usual melanite variety, brown in thin section. This rock contains pyrites.

Aegirine Trachyte.

Sp. gr. 2·61.

Occurs on Mount Mary, just above the mine.

Mineral constituents.

Sanidine, augite, melanite, titanite, aegirine, biotite, apatite.

Macroscopical characters.

A compact greenish grey rock, with large isolated glistening tabular crystals of sanidine. Numerous small black garnets embedded in the rock, and dark augite prisms visible under hand-lens.

Microscopical characters.

The large sanidine crystals are clear and fresh-looking. Dodecahedral sections of brown-zoned garnet in simple and compound forms enclose prisms of augite. These large garnets are a feature in the rock slice. Green pleochroic augite in imperfect forms of the prism occurs

* System of Mineralogy, 1898, p. 446.

in nests. The extinction angle is as high as 37°, and the mineral often encloses crystals of apatite. a yellowish green, b yellowish, c green. Some spheneis present porphyritically. A little pale yellowish brown biotite is associated with the nests of augite crystals. It can be picked out in the slide by its strong pleochroism—a yellowish brown, c opaque.

The groundmass consists of small lath-shaped sections of sanidine with fluxional arrangement and pale green pleochroic rods of aegirine extinguishing parallel to their length. Granules and small crystals of sphene are plentiful. There is some isotropic material of a zeolitic nature.

Melanite-Trachyte.

Stones of this rock were found at the back of Widow Cleary's cottage on the road to Cradoc, about 2 miles N.W. of Lovett, at the foot of the green conical hill which rises there from the road. The hill exposes permo-carboniferous mudstones a few hundred feet up, with abundant marine fossils. This is the most northerly extension of the trachyte which we examined, but we could not find it *in situ*.

Macroscopical characters.

Light brown in colour, granular in texture, studded with brilliant black crystals of melanite-garnet. This mineral is such a constant and abundant accessory that the rock may well be called a melanite-trachyte.

Mineral constituents.

Orthoclase, perthite, melanite, augite, apatite, biotite, sphene, analcime, chlorite, limonite (manganese ?).

Microscopical characters.

The most frequent porphyritic element is melanite-garnet, light and yellowish-brown, in thin section, in the usual forms, and strongly zoned in successive layers. The garnet crystals are habitually intergrown with, and enclose augite. The next most important phenocrysts are those of a green pleochroic augite, with an extinction angle not exceeding 33°. a light green, c deep green, often encloses apatite. There are occasional large porphyritic crystals of fresh orthoclase and perthite, with zonal tendencies. The holocrystalline groundmass comprises orthoclase laths and allotriomorphic felspar; sphene in crystals and grains; some normal biotite; chlorite in scales as a pseudomorph; a little analcime and limonite, with purplish iron oxide (manganiferous ?).

Trachyte.

Sp. gr. 2·7.

On Lymington Road, opposite Martin's cottage.

Macroscopical characters.

A bold exposure on the west bank of the road of a pearl-grey granitoid rock resembling a fine-grained syenite, but essentially trachytic in nature. The groundmass is of even granular texture, with a few larger crystals of glassy felspar, with 010 faces and idiomorphic outlines. Felspar makes up the bulk of the rock; prisms of hornblende numerous; augite is present also, but cannot be distinguished macroscopically from the hornblende. The rock weathers little, but, when affected, the felspars become yellow and opaque.

Mineral constituents.

Sanidine, oligoclase (albite ?), hornblende, augite, sphene, apatite, zircon, magnetite, quartz.

Microscopical characters.

Those of a typical trachyte, somewhat near andesite, the main feature being tabular phenocrysts of zoned felspar in a granular felspathic groundmass. The hornblende phenocrysts are numerous enough to be considered as essential constituents. The augite recedes in quantity to ; cessory value. It is difficult to locate this rock i special position in the trachyte group. The for felspar are similar to those prevailing in andesitic trac and there is a good deal of oligoclase; but there development of glass, and the rock is not lava-li appearance.

Felspars.—Isometric forms prevail. Carlsbad with 010 faces are frequent, and zonal structu characteristically developed. In no other rock ir mania have we seen the concentric zonal markir beautifully exhibited. Striped felspar is prese quantity, its extinction angles being those of olig andesine. We have not been able to measure an high enough for albite on an 010 section, but a st felspar, intergrown with a crystal of sanidine, ga angle of 20°, and this may be albite. The felspa uncommonly free from inclusions of the other mine the rock.

Hornblende.—Next to felspar, this is the most pron constituent in dark green columnar forms. The green color is often so deep as to make the mineral o and occasions difficulty in reading off the extinction The absorption scheme is $b \geq c > a$, and the pleoch a yellowish-green, b very dark green, c dark sometimes opague. The extinction angle is unu high, the values which we obtained being 20°, 21°, 2 28°, 30°, 31°, 32°. These agree very well with Pro Brögger's cataphoritic hornblende, though the abso scale does not correspond; it is evidently a hornl with cataphoritic tendencies.

Augite is not frequent; it occurs mostly in forms prism. Extinction angle 38°, very pale green, non chroic: crystalline sphene, apatite and zircon are co accessories. The groundmass is not fluxional, but c line-granular. In it are a few rounded blebs of aurrounded by a fringe of re-crystallised felspar containing some moving bubbles; magnetite grains great quantity, and no mica discernable.

Malchite.

Sp. gr. 2·79.

This rock was found on Mr. Cranny's property, a ing Coad's farm, at Lymington. It occurs on the the hill, but its geological relations were not f examined. Locally it is called "basalt."

Macroscopical characters.

Those of diorite, granular in texture, dark gre colour, owing to the green hornblende which forn bulk of the rock. It is iron-stained along short irr cleavage planes.

Mineral constituents.

Hornblende, biotite, augite, plagioclase, apatite, sp

Microscopical characters.

Essentially dioritic. What is remarkable is the d dominance of hornblende as a constituent of the This mineral forms irregular hypidiomorphic plates, reduced to a granular condition by dynamo-metamorp It is intergrown with biotite, which often accumula nests or aggregations of flakes. In the hornb $c : c$ = about 14°. a pale yellowish green, b dark l green, c dark green. The biotite is the ordinary Some of the felspars are larger than the rest, and are hypidiomorphic, while the smaller felspars o pseudo-groundmass are allotriomorphic. Many fe are simply twinned on the Carlsbad plan, others twinned. A good deal of the felspar appears to be dorite. The other constituents are apatite, sphene, q and pale augite in small quantities.

The predominance of hornblende and the al morphic felspars may be looked upon as exceptior

pure and simple. Our rock is certainly dioritic, structure is rather aplitic than plutonic, conse- belonging to the dyke series of diorites. It is at schistose in thin section, though not so macro- lly. It seems allied to the plagioclase hornblende described by Osann from the Odenwald, and called malchite. Of our slides of the malchitic rocks— luciite, and malchite—luciite most resembles ours, do not grasp the essential distinctions intended to essed by these divisions. The quartz in our variety nt in very small quantity.

not easy to understand the occurrence of a dioritic this plexus of trachytes; and, in view of the fact rofessor Rosenbusch in his recent "Elements of gy" (p. 135) has stated that diorites not only have mical or mineralogical relationship with the alkali s, but have never been found integrally associated iem, we would reserve the present peculiar rock additional examination which it merits and s.

DISTRICT OF LITTLE OYSTER COVE.

KALI SYENITE, WITH ACCESSORY ELAEOLITE.

is represented by a piece of rock from Mr. Innes's y, a mile back from Oyster Cove. We have not ble to examine the occurrence *in situ*, and from the quantity of material at our disposal we can only general account of the characters of the rock.

oscopically it is a very light-coloured stone, ring easily, and resembling a coarse trachyte rather syenite. It may be compared with those elaeolitic s which have a tendency to trachytic structure.

er the microscope this pseudo-trachytic appearance itself by the larger felspars (sometimes idio- ic) being cemented or surrounded by a holocrys- groundmass of smaller hypidiomorphic and allo- rphic felspars. There is, however, great variation in e of the latter. There is a remarkable absence of d constituents. A flake or two of biotite is the ferro-magnesian mineral which we can detect. e, zircon, and apatite are accessories.

oclase felspar preponderates. It is fresh and often Oligoclase is freely intergrown with it. Some of eaky, like the orthoclase of the Norwegian elaeolite s, and has an undulose extinction. There is esidual felspar (albite) in its clearness resembling

ie rock are certain irregular and imperfect forms of e, a few basal sections being isotropic. This deter- on was confirmed by digesting the rock in HCl and ng a fair quantity of gelatinous silica.

e is not sufficient of the felspathoid to constitute ck a true elaeolite syenite, besides which the ne and hornblende so abundant in elaeolite syenites re conspicuously absent. It is rather one of lkali syenites which occasionally carry subordinate e.

TRACHYTE.

ave examined three varieties of trachyte rock from Oyster Cove. They all appear to belong to the s complex, which embraces both the Port Cygnet ster Cove Districts. They carry identical minerals, anidine and oligoclase, cataphoritic hornblendes, ugite, sphene, zircon, and apatite; and, from gar- ous gold-bearing sand found in the neighbourhood, w that melanite-garnet is also an ingregient. From w specimens which we have seen, it is likely in the Port Cygnet series, these also are rich in s.

he whole they exhibit a tendency to vary in the n of the andesites, the dominant porphyritic felspar plagioclastic, and an increase of iron ore in the mass showing itself. The small felspars of the groundmass are often minutely granular or allotriomorphic, but where prismatic they show straight extinction, which may mean sanidine or oligoclase. The porphyritic felspars are large and scattered; zonal structure common. A large orthoclase crystal, giving a section parallel to the clino-pinacoid, showed a characteristic extinction angle of 22°. The hornblende is green, basal sections brownish green; extinction angle about 14°, and the absorption that of cataphoritic hornblende, $b > c > a$.

The preceding form a complete series of a unique set of rocks so far as Tasmania is concerned. To the geologist they are important as being the youngest matrix of gold in the colony. The trachytes appear to have shed the gold which has been won on the alluvial field at Lymington and found in the gullies on Mt. Mary. They are in places veined with quartz, but it is not at all clear that the quartz itself is auriferous, and the veins have not the characteristics of true fissures. We have seen some sand collected from a creek about a mile back from Little Oyster Cove towards Port Cygnet, which contains flaky gold, more or less waterworn, with numerous melanite garnets, zircons, and small crystals of sphene. It is a sand which is evidently the detritus of the garnetiferous trachytes, and the occurrence in it of gold associated with the minerals just named supports the idea that the trachytes are the source of the gold throughout the whole province. There is nothing intrinsically inconsistent in the occurrence of gold in the quartz veins of trachytes. It is found in various parts of the world in much younger trachytes and andesites than these, though the gold-bearing reefs in the rest of Tasmania are of older date and traverse Silurian slates and sandstones. But, so far as we can see at present, there is no trustworthy evidence to show that the Port Cygnet quartz veins are auriferous, while, on the other hand, there is some reason for believing the trachytes themselves to contain sparingly disseminated gold, especially where they are silicified and brecciated. The miners are pursuing the right course in selecting these tuffaceous and siliceous zones for exploration. Unfortunately the mining work which is being carried on has not so far proved the existence of the precious metal in the matrix in anything like payable quantities. Whether the gold has been concentrated anywhere to a greater extent than in the parts hitherto exploited, remains for future search to decide. The pyrite in these rocks has so far proved non-auriferous.

CONCLUSION.

We have abstained from referring to several additional minor varieties of trachytic rock which we have collected, and which differ slightly from the foregoing, but their minute description in this connection would serve no practical purpose, and we doubt not the discovery of further types will reward the diligent collector. The results of our enquiry may be conveniently summarised as follows:—

1. All round the arm of the Huon, known as Port Cygnet, there is an extensive development of porphyritic rocks, which are phonolitic or soda-trachytes containing haüyne, aegirine, analcime, and cataphoritic hornblende. Some of these furnish the finest examples of orthoclase felspar crystals to be found in the island.

2. The trachytic area extends to Little Oyster Cove on the N.E., to the N. of Lovett as far as Sugar Loaf Hill, to the S. of Lovett as far as Lymington and the Huon, but requires further exploration beyond these limits.

3. The trachytes are lava sheets contemporaneous with Permo-Carboniferous sandstones and mudstones.

4. Associated with these trachytic lavas and their tuffs are allied plutonic and dyke rocks, also of a sodic nature; viz., alkali-syenite (containing elaeolite) and haüyne-aplite.

5. There is an interesting development of melanite-garnet in the trachytes and syenite. This garnet seems to run through the whole series, and is a constituent of the auriferous sands of the district.

6. The dark green rock of the locality described in the older literature as "metamorphic," and looking such to the naked eye, is shown by the microscope to be ægirine-trachyte, full of minute acicular crystals of the green soda pyroxene ægirine.

7. Gold has been found at Lovett, Lymington, and Little Oyster Cove, mostly alluvial, a minute quantity *in situ*. It is highly probable that the alluvial gold has been derived from the trachyte, disseminated therein in small quantities. The few quartz veins in the trachyte do not seem to have collected this gold to any special extent, though what gold has been found in the matrix has occurred in their neighbourhood. The quartz is so closely associated with, and banded with, trachyte that the assay results are inconclusive. Appearances are against these quartz veins being true lodes.

8. This highly interesting, though small, peculiar petrographical province is a purely local one, confined, so far as we know, to this part of Tasmania. Its unexpected discovery may be placed to the credit of the young and expanding science of microscopical petrology.*

* Since writing the above we have seen Prof. Rosenbusch's new work on the Elements of Petrology (Elemente der Gesteinslehre, 1898), in which he groups the trachytes and quartzless porphyries (orthophyres) in one family. He says, (pp. 265–6), "Orthophyres differ from trachytes only in their greater age and consequent inferior preservation, viz., in the more frequent red and brown color, diminished porosity of the ground-mass, dull aspect of the felspars and extreme decomposition of the colored constituents. Fresh orthophyres cannot be distinguished from trachytes." Referring to the sanidine in orthophyres, he adds, (p. 266) :—"In the quartzless porphyries sanidine has mostly, though by no means always, surrendered its glassy habit, and possesses the habit and often the red color of orthoclase."

EXPLANATION OF PLATES.

FIG. 1.—Section of trachyte showing zoned crystal of or Mount Mary, S.W. Lovett. × nicols. × 16.

FIG. 2.—Section of melanite-trachyte with zoned cr melanite-garnet. Cleary's Hill, N.W. of Lovet light. × 16.

FIG. 3.—Section of haüyne-aplite or haüyne-trachyte dy with large Carlsbad twins of sanidine carrying crystals of haüyne. Groundmass = crystals augite and haüyne with allotriomorphic orthoc spar. From Port Cygnet. × nicols. × 16.

FIG. 4.—Section of trachyte from back road, two miles Lymington. Porphyritic crystals = sanidine i bad twins and zoned, plagioclase, green hornble augite. × nicols. × 16.

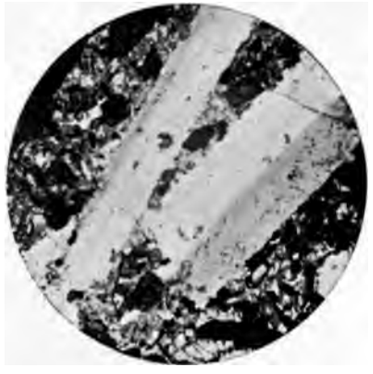
FIG. 5.—Section of haüyne-trachyte from Livingstone Hi of Lovett, showing large porphyritic sanidin dark hexagon on the left represents melanite the smaller crystal below it is green augite. Si ing these two crystals are small forms of × nicols. × 16.

FIG. 6.—Section of green aegirine-trachyte from beac Lovett. Porphyritic sanidine and augite. Gro = rods of pale green aegirine and prisms of with fluxion structure. Plain light. × 16.

FIGS. 7 AND 8.—Megascopic photographs of dull tabular clase (decomposed sanidine) crystals in haüyne- on Livingstone Hill, N.E. of Lovett. Natural si

1.

2.



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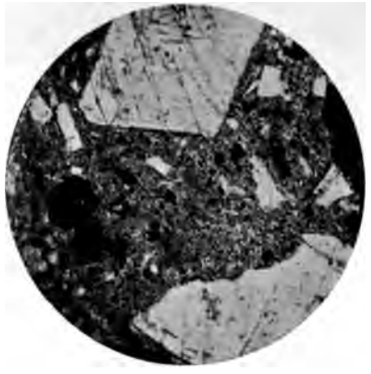

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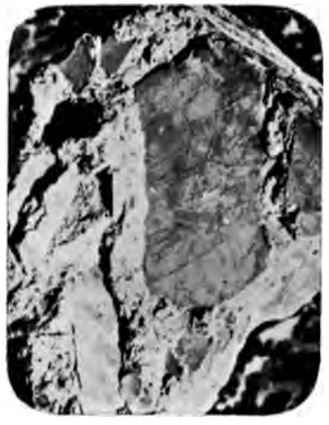

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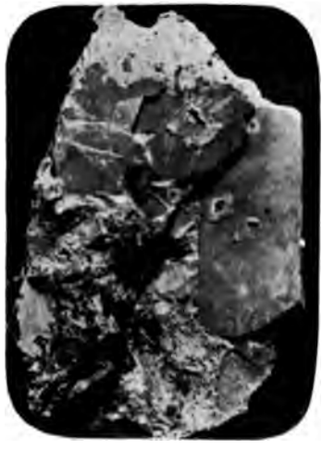

8.

TRACHYTE FROM PORT CYGNET.

NOTE ON HUMERI OF TASMANIAN LABYRINTHODONTS.

BY W. H. TWELVETREES, F.G.S., AND W. F. PETTERD, C.M.Z.S.

LAST year we received from Dr. Hy. Woodward, Keeper of the Geological Collections in the British Museum (South Kensington) the *replica* of a cast in the British Museum Collection which had been obtained from Dr. Joseph Milligan, formerly of Hobart, and was labelled by Professor Owen "Humerus of labyrinthodont reptile from sandstone, probably carboniferous, Tasmania." Soon after informing Mr. Alex. Morton, Curator of the Tasmania Museum, of this circumstance, that gentleman brought to our notice and placed in our hands for examination a fossil bone (in two pieces), found in the sandstone quarry, near Government House, in the Domain, Hobart, and presented to the Museum, in 1856, by Mr. Kay, Director of Public Works. This bone, unnoticed for over forty years, is labelled "Humerus of a labyrinthodont reptile . . . . has been examined by Professor Owen," and on the reverse is written by one of the authorities at the British Museum, "Try Eosaurus of Marsh." Both the British and Tasmanian Museum specimens are left humeri, and unquestionably belong to the same genus, if not the same species.

Geological position.

The precise age of the sandstone beds in the Domain, at Hobart, is not yet beyond question, but the evidence available points to it being either Upper Permian or Lower Trias. The Cascade, Knocklofty, and other sandstones of presumably the same geological horizon have yielded Vertebraria Australis and fish remains referred by Mr. R. M. Johnston and Mr. Alex. Morton to the genus "Acrolepis."* According to these authors, similar sandstones in this part of Tasmania succeed the Upper Permo-Carboniferous marine strata with apparent conformability, and are classed by Mr. Johnston in his latest tabular scheme of Tasmanian formations as the lower sandstone series of the Trias.† They are correlated by him approximately with the Hawkesbury beds and Narrabeen series of New South Wales, and the Burrum coal fields or Mr. R. L. Jack's Lower Trias-Jura of Queensland. We find a difficulty in naming more distant equivalents of these sandstones. The few fossils found in them and named above are consistent with an Upper Permian age. Acrolepis is a well-known Upper Carboniferous and Permian fish; but, so far, we must confess the materials do not exist for placing the beds with any degree of confidence on any distinct horizon in the Gondwana system of India or the Karoo strata of South Africa, though they evidently belonged to the ancient Gondwana land represented by those systems. In a letter received this year from Professor Amalitzky, he refers to his recent discovery of Pareiosaurus, Glossopteris with its rhizome vertebraria, Tæniopteris, &c. in the Upper Permian of the North Dwina, Russia; and we are not yet convinced that an Upper Permian age for the Hobart sandstones is definitely excluded. Be this as it may, the Upper Permian and Triassic stratified rocks all over the world—in England, Germany, Russia, United States, South Africa, and India—are known to include remains of labyrinthodont amphibia as well as the higher reptiles. Investigators are still engaged in working out the correlation of these widely-separated sedimentary formations, the exact horizon of which is not yet altogether settled. There is hardly any doubt that these sandstones, so similar in all the countries just mentioned, were laid down in fresh water, possibly in lakes, though we think more probably they belonged to large river systems.

Description.

The British Museum bone is 66 mm. long, the Hobart one, 62 mm.: the breadth of the distal end in both specimens is 23 mm.: of the proximal end or head, 20 mm. The deltoid crest is developed into a strong bony process which is prolonged as a ridge distad down the narrowest part of the shaft, where it subsides. The anconal depression at the distal end is sub-deltoidal, being a well-defined shallow, trochlear groove, widening distad, and separating the extremity into the two condyles, ulnar and radial. The ends are broader across than they are thick, and are fairly expanded, though not so much as is generally the case in Anomodont and Dicynodont reptiles; neither does the bone shew the sigmoid shape of a lacertian humerus. The articular surfaces of both ends are abraded, exposing uniformly cancellous structure of the osseous substance. A transverse section of the shaft shews a loose cancellous character all through: the cancelli are coarser towards the centre, but there is no medullary cavity as in the Onomodontia, Dinosauria, and other extinct reptilia, nor is there any differentiation into peripheral bony wall and spongy cancellated centre, as in some Permian reptiles. It is true Prof. Owen refers to a femur of Rhombopholis scutulatus as being hollow,* but it is not certain that Rhombopholis was labyrinthodont.† Indeed, very few limb bones of labyrinthodont amphibia have been determined: a glance at the annexed list shews that the species and genera of the order have been always founded on vertebræ, jaws and other parts of the skull. Hence, in discoveries of isolated bones as those under review, caution is needed in drawing conclusions.

Under the microscope the larger cancelli are seen to be filled with opaque earthy material. They are sigmoid, elliptical, branched and otherwise irregular in shape, and often contain grains of quartz derived from the sandstone and confirming the authenticity of the specimen. The osseous substance surrounding the cancelli is sprinkled with ellipsoidal and fusiform cells only faintly and occasionally discernible in the slide. These are, doubtless, bone lacunæ, masked by the balsam of the mount.

The only conclusion which can be legitimately drawn from the form and structure of these humeri seems to be that they belonged to amphibian vertebrates. Although any more definite reference is impossible at present, it, nevertheless, appears to us desirable to place these remains on record, and thus render them available for comparison with future discoveries.

* Trans. Roy. Soc., Tasmania, 1889, p. 102; 1890, p. 152.

† Historical Sketch of the Geological Relations of Australia and Tasmania: Trans. Austr. Inst. Min. Engineers, 1895.

* Owen. Palæontology, 1861, p. 215.

† On the remains of Labyrinthodonts from the sandstone of Warwick L. Miall. 2 J. Geol. Soc. 1874. p. 433.

EXPLANATION OF PLATE.

FIG. 1.—Humerus of labyrinthodont amphibian from Lower Mesozoic sandstone, Tasmania. British Museum cast. Anconal (back) aspect. Nat. size.

FIG. 2.—Ditto, ditto. Thenal (front) aspect. Ditto.

FIG. 3.—Humerus from Domain sandstone quarry. Hobart: Lower Mesozoic. Thenal (front) aspect. Nat. size.

FIG. 4.—Microscopical section of shaft of humerus, Nos. 2 and 3, showing cancellous structure of bone. × 10.

More or less well-known LABYRINTHODONT GENERA AND SPECIES, exclusive of the Salamandroid and Serpentine Forms of the Sub-Orders Microsauria, Aistopoda, and Branchiosauria.

GENERA.	LOCALITY.	HORIZON.	FOUNDED ON
Eosaurus acadianus (Marsh)	Coal Measures, Nova Scotia	Carboniferous	2 vertebral centra.
Anthracosaurus Russelli (Huxley)	Ditto, Lanarkshire	Ditto	Skull, ribs, and vertebra.
Loxomma	Gilmerton, near Edinburgh	Ditto	
Loxomma Allmani (Huxley)	Shropshire and Northumberland	Ditto	Skull, vertebrae, ribs, humerus.
Pholiderpeton	Gilmerton, near Edinburgh	Ditto	
Pteroplax	Coal Measures, Northumberland	Ditto	Skulls.
Macromerium scoticum (Lydekker)	Gilmerton, near Edinburgh	Ditto	Jaw.
Baphetes planiceps (Owen)	Picton Coal, Nova Scotia	Ditto	Part of skull.
Ichthyerpetum	Jarrow Colliery, Kilkenny	Ditto	
Dendrerpetum ?	Coal Measures, Nova Scotia	Ditto	
Pholidogaster	Edinburgh	Ditto	
Raniceps (Wyman) ?	Cannel Coal, Ohio, U.S.	Ditto	Skull, vertebrae, fore-limbs.
Actinodon latirostris (Jordan sp.)	Saarbrück	Permian	Skull.
Archegosaurus Decheni (Goldfuss)	Ditto	Ditto	Skull.
Euchirosaurus Rochei (Gaudry)	France	Ditto	Vertebrae.
Nyrania	Bohemia	Ditto	
Loxomma sp. (Fritsch)	Rothliegendes of Bohemia	Ditto	Jaw.
Macromerium Schwarzenbergi (Fritsch)	Bohemia	Ditto	Jaw.
Ditto bicolor (Ditto)	Ditto	Ditto	
Labyrinthodon Bucklandi (Lloyd)	Sandstone, near Kenilworth	Ditto	Skull.
Cochleosaurus (Fritsch)	Gas Coal, Bohemia	Ditto	
Chelyosaurus (Ditto)			
Gaudrya (Ditto)			
Sparagmites (Ditto)			
Micropholis Stowii (Huxley)	Beaufort Beds, Karoo, S. Africa	Ditto	
Dasyceps Bucklandi	Warwickshire	Ditto ?	
Platyops Rickardi (Twelvetrees)	Kargalinsk Sandstone, Russia	Ditto	Part of skull.
Brachyops laticeps (Owen)	Mangli, Upper Damudas, India	Ditto ?	
Gondwanosaurus bijoriensis (Lydekker)	Bijori, ditto	Ditto ?	Skeleton.
Eryops megacephalus (Cope)	Texas	Reputed Permian	Jaw.
Trimerorachis	Texas	Ditto	
Eryops Oweni (Lydekker)	Karoo, South Africa	Permian or Trias	Jaw.
Bothriceps Huxleyi	Karoo, South Africa	Trias ?	Skull.
Bothriceps australis (Huxley)	Australia	Unknown	Ditto.
Mastodonsaurus (v. Meyer)	Keuper sandstone, Würtemberg	Trias	Skull and vertebrae.
Capitosaurus robustus (v. Meyer)	Ditto, Stuttgart	Ditto	
Trematosaurus Braunii (v. Meyer)	Bunter sandstone, Bernbourg	Ditto	Skull.
Labyrinthodon leptognathus (Owen)	Keuper sandstone, Warwick	Ditto	Vertebræ, sternum, and part of skull.
Ditto pachygnathus (Owen)	Ditto	Ditto	Skulls, humerus, femur, ilium, phalanges.
Diadetognathus varvicensis (Miall)	Ditto	Ditto	Jaws.
Capitosaurus arenaceus (Münster)	Bunter sandstone, Germany	Ditto	
Metoposaurus diagnosticus (v. Meyer)	Near Stuttgart	Ditto	Skull.
Odontosaurus Voltzii (v. Meyer)	Bunter sandstone, Soultz-les-Bains	Ditto	Jaw.
Platyceps Wilkinsonii (Stephens)	Hawkesbury beds, Gosford, N.S.W.	Ditto	Skeleton.
Gonioglyptus longirostris	Pánchets of India	Ditto	
Ditto Huxleyi			
Glyptognathus fragilis			
Pachygonia incurvata			
Rhytidosteus capensis (Owen)	Beersheba, Orange Free State	Ditto ?	Part of skull.
Petrophryne granulata (Owen)	Cape of Good Hope	Ditto ?	Skull.
Rhinosaurus Jasikovii (Fischer)	Simbirsk, Russia	Jura ?	Skull.
Pachygonia incurvata	Maleri of India	Oolite ?	

1.

2.

3.

x 10.

4.

LABYRINTHODONT HUMERI.

ON THE FELSITES AND ASSOCIATED ROCKS OF MOUNT READ AND VICINITY.

BY W. H. TWELVETREES, F.G.S., AND W. F. PETTERD, C.M.Z.S.

ASSOCIATED with the schists of Mount Read and district are some obscure igneous rocks, siliceous in nature, compact in grain, often slightly schistose, which are what the field geologist calls felsites or felstones. These terms, however convenient, need explanation, for in different countries they carry different meanings. In Germany the word felsite (or micro-felsite) is applied to the compact homogeneous-looking groundmass of quartz porphyries. These porphyries are the acid volcanics of pretertiary age. In England, on the other hand, felsite designates the rock, not its groundmass merely. If the petrographers of each country could throw over the historical significance of their terms and come to some international agreement as to rock nomenclature and the meaning to be attached to terms, much of the present deplorable confusion would disappear. At present the discordance is considerable. The following extracts serve to indicate the English usage :—

*Cole.**—Quartz-felsite=Eurite=" the fine-grained and compact forms of granite." " Felsite is so differently used by different writers that its reputation as a rock name is lost."

Hatch.†—Felsite=" the acid quartzo-felspathic lavas—the devitrified rhyolites and obsidians."

Rutley.‡—Felsite=" devitrified obsidians and pitchstones. Felsites are not exclusively devitrified rocks; in some cases they occur as dykes and then approximate to the micro-granites or granophyres." Quartz-felsite=" apophyres of deep-seated granite masses (Elvan group)."

Harker.§—Felsites=" acid intrusives. The name 'felsite,' or, if containing evident phenocrysts of quartz, 'quartz-felsite,' has been applied in this country not only to these rocks but also to many volcanic rocks (acid and intermediate), and their usage lacks precision and significance."

Teall.‖—Acid rocks=" Felsite, Eurite petrosilex. These terms are practically synonymous. They have been applied to compact stony rocks, the mineralogical composition of which cannot be ascertained by examination with the naked eye or with a lens."

Jas. Geikie.¶—Quartz-felsite=Quartz-porphyry. " In this rock we have a compact groundmass of felsitic matter, through which are scattered macroscopic or microscopic crystals or crystalline granules of quartz and orthoclase. . . . . It seems probable that micro-felsitic matter is simply the result of devitrification of a glassy base."

*Sir A. Geikie.***—Felsite (felstone.) " Originally vitreous lavas like the rhyolites, but which have undergone complete devitrification, though frequently the perlitic, spherulitic, and flow structures."

Teall.††—Acid intrusives=felsophyre, granophyre, micro-granite. Acid volcanic=devitrified rhyolites, obsidians, and pitchstones.

These samples show that, what with acid intrusives, acid volcanics, elvans, devitrified obsidians and rhyolites, granophyres, micro-granites, quartz-felspathic lavas and the rest, the term has come to mean nothing more precise than a compact ancient acid rock. Hence some petrographers abandon its use altogether, and parcel out the rocks covered by it, some among the ancient rhyolites, the rest among micro-granites.

A different nomenclature is adopted in Germany. This family is included by Rosenbusch in Liparites and quartz porphyries. In his recent work‡‡ he says :—" The difference between liparite and quartz porphyry is one of age : quartz porphyries are pretertiary palæo-volcanics, liparites are neo-volcanic tertiary rocks, consequently young quartz porphyries." He defines them as effusive rocks of normal granitic magma, and divides them into two sections, viz., (*a*) microgranitic and granophyric quartz porphyries, (*b*) felsophyric and vitrophyric quartz porphyries. Under different names we see there are still two main groups, the microgranitic and the rhyolitic; though, as they are both classed as effusive rocks, we cannot carry out any exact comparison with the English usage.

It is accordingly necessary to explain the sense in which we attach names to the Tasmanian rocks. While the particular name has a certain importance, it is equally important for us to understand the rocks to which it is applied. Seeing that quartz porphyry is so widely used in England for compact granitic protrusions, we propose to confine the terms felsite and quartz felsite to devitrified acid lavas. The term quartz-keratophyre is applied to the same rocks when containing an alkali-felspar rich in soda. Keratophyre, the syenitic equivalent = soda felsite : quartz keratophyre = soda quartz felsite. This terminology can be correlated with Rosenbusch as follows :—

Here defined.	*Rosenbusch.*
Felsite.	Felsophyre felsite rock.
Quartz felsite.	Felsophyric quartz porphyry.
Keratophyre = Soda felsite.	Keratophyre.
Quartz-keratophyre = Soda-quartz-felsite.	Quartz-keratophyre.

The groundmass of felsites is characteristically felsitic. What felsitic matter really is has occasioned much discussion among petrologists, and a definite result can hardly be said to have been yet attained. The compact groundmass irresolvable by the naked eye or the hand lens is often resolved by the microscope into an intimate aggregate of minute crystalline-granular quartz and felspar, giving a confused speckled appearance between × nicols.

When the component individuals of the aggregate become more minute and indefinable, the groundmass is what Rosenbusch calls crypto-crystalline. This is the felsitic material. And, following the process of resolution still further, we arrive at the ultimate isotropic vitreous base. But more frequently further resolution discloses a minute aggregate of isotropic granular or flaky material which we assume to be a devitrification product, though this is mostly not susceptible of proof (miscro-felsite, Rosenbusch). From Vogelsang's researches it is probable that this micro-felsitic material is no longer a mechanical aggregate of quartz and felspar, but an independent silicate. (See the lucid exposition given by Rosenbusch, Mass. Gest., p. 668.)

Under such conditions it is not wonderful that the Mount Read rocks, masked by great geological age, and distorted and mineralogically reconstructed by intense dynamic metamorphism, should prove puzzling to the geologist. Their felsitic nature is often obscured by green colouration due to the free development of chlorite, which gives a very different appearance from that of the light coloured hälleflinta-like aspect of so many of the more typical felsites. It must be premised that the rocks not only occur in the Zone of the West Coast argillitic and phyllitic schists, but have themselves been affected by the forces which produced the foliation of the schists. Hence they have a more or less banded or schistose appearance, though, owing to their greater hardness compared with the slates, they are not foliated to anything like the same extent. The effect is often only shown by obscure banding or streaking, while elsewhere there is a more decided approach to schistosity. Sometimes a few reddish porphyritic felspars are discernible, but as a rule the rock has a streaked reddish and greenish flinty aspect, as if the original porphyritic crystals had been rolled out and their material diffused. The colour of different varieties, however, varies a good deal, ranging from yellowish white to reddish.

* Aids in Practical Geology, 1893, p. 201.
† An Introduction to the Study of Petrology, 1891, p. 85.
‡ Granites and Greenstones, p. 15.
§ Petrology for Students, 1897, p. 100.
‖ British Petrography, p. 291.
¶ Outlines of Geology, 1888, p.p. 152-153.
** Text Book of Geology, 1893, p. 161.
†† British Petrography, p. 296.
‡‡ Elemente der Gesteinslehre, 1898, p. 230.

Specific Gravity.

Teall states the sp. gr. of felsites and liparites as ranging from 2·53 to 2·7. Our determinations of the Mount Read felsites, comprising numerous selected specimens, are :—

2·6, 2·62, 2·63, 2·65, 2·68, 2·7, 2·74.

The specific gravities of the Lenne-porphyries of Westphalia (Keratophyres and Quartz Keratophyres) given in O. Mügge's important paper may be usefully compared.

Quartz-keratophyre, 2·648, 2·654, 2·647.
Felso-keratophyre, 2·62 (non-schistose), 2·638, 2·74 (high sp. gr. due to chlorite), 2·65, 2·75.

Also those furnished by Rosenbusch :—

Keratophyre, 2·611, 2·677.
Quartz-keratophyre, 2·709, 2·647, 2·620, 2·64 2·634, 2·614, 2·632.

The specific gravity of the Tasmanian felsite is consequently quite in accord with what has been observed elsewhere.

Intrusive or Effusive.

The relations of the rocks to the argillitic metalliferous schists are far from being definitely established, and require close working out over an extended area. Owing to the densely timbered country and paucity of serious mining operations, this is a task of extreme difficulty. All that has been done hitherto has been to notice the fact of their occurrence here and there, especially where the country has been cleared a little for mining work. On the north side of Mount Read on the North Hercules, Barlen, and Consols sections, this rock is prevalent, sometimes as a greenish flinty schistose or fissile felsite, and towards the bottom of the track going down to the Ring River valley in abrupt massive cliffs of a green and reddish streaked compact siliceous felsite. It has here the appearance of an intrusive mass, but this may be with equal probability the exposure of a thick lava mass. A common characteristic of metamorphosed felsites and their tuffs in schist areas is the indefinable nature of the boundary line separating them from the schists. This seems to be the case in this region, and is a fact in support of their contemporaneity. We have seen the same felsite in the shaft at Mount Black Mine, and still further north on the Tasmanian Copper Company's property between Rosebery Township and the Pieman River. Further south, too, it occurs in the direction of Red Hills and Mount Darwin ; and a very coarse granular chlorite-stained variety of the same series is found on the White Spur between Moore's Pimple and Mount Read. This zone therefore extends in a N. and S. direction for about twenty miles, while E. and W. its breadth is comparatively small. The zone of felsites seems to mark the upturned edges of sheets of lava roughly parallel with the axis of the present West Coast range. These lavas were probably geologically contemporaneous with the argillaceous sediments now converted into schists, and with them were folded, crumpled and rolled out into the schistose, banded conditions in which we now find all the rocks of this belt of country. At least this interpretation is the one which seems to us the most feasible in the present state of our knowledge of this difficult piece of country.

Their relations to the Ore Beds.

This fact confronts us : Whenever the felsite appears in tunnels driven through the metal-bearing phyllites or schists, ore is no longer found ; the felsitic rock is barren. The occurrence of a band of this felsite in an adit is suggestive, at the first blush, of an intrusion ; but the absence of sharply-defined walls is against the idea, and it can be explained quite satisfactorily on the supposition that it is an intercalated sheet. It cuts off the ore simply because the ore is not contained in a lode fissure, but has been deposited by a process of segregation, or has replaced the original rock by metasomatic substitution. The ore bodies on Mount Read form lenticular masses in the argillitic schists parallel with the plane of foliation, and disposed at irregular intervals in directions parallel to each other. The deposition took place probably subsequently to foliation, judging from the parallelisms with the enclosing schists. This is seen on a small scale in some of these mines, where the ore follows a minute arching and of the schist without dislocation. These lenticular have been looked upon as segregations of minera crevices or lines of weakness in the rock. It is difficult to imagine cavities of the required size e in the rock in readiness for filling up with miner there is nothing improbable in supposing the partin of the schists to be the first channels for the preci from solutions of their metallic contents. The of replacement might then very well start fron channels and remove the country rock on eith leaving ore in its place. The suggestion that the le ore bodies represent old lake bottoms has not the tes to support it which can be adduced in favor of the matic hypothesis. The sulphides of the Rio Tint in Spain which have been appealed to are mostly filling fissures which separate slates and intrusive porphyry ; and it is only iron ore lying in horizont of miocene age with plant remains which can be r to a sedimentary origin. Those conditions are n parable with the mineral zones on Mounts Black an Here the ore bodies follow the dips and foliation of the enclosing schists which on Mount Read dip at a high angle with a strike from 10° to 20° W. of N lenticular forms of these bodies are suggestive of ment having gone on *pari passu* with the operati solvent. They differ from true lodes in alway found conformable to the surrounding schist, an both fissure and segregation veins in having no ga matrix different from the country rock. The f planes have apparently served as initial channels mineralised solutions which attacked and remo schist on each side, and left their mineral contents It is obvious that in such a process there wou beginning : the attacking solution would attain a ma of power and gradually decrease to a minimum. Th would be a lens-shaped body of mineral. The q presents itself, are such deposits as permanent lodes ? But this is hardly the appropriate form fo query. It would be more proper to ask, are th deposits as reliable as the *pitches* or *shoots* of ore lodes ? We know very well that, though mineral lodes go down to apparently quite inaccessible de the earth's crust, the courses of ore which they con inconstant and irregular. A metalliferous zone is f by a barren one, or *vice versâ*. Therefore, to ins just comparison, we must imagine the partings schist to correspond with a lode fissure, and the le ore bodies with the ore shoots in a lode. The d which these foliation planes extend depends (1) u magnitude of the anticlinal or synclinal flexure t the sedimentary rocks were subjected, and (2) u extent to which the secondary foliating agency them. This form of deposit has an advantage ov bodies, in that there has often been the opportu the formation of numerous ore bodies on parall following parallel parting planes of the schist. bodies come in and die out in these channels as ore do in a lode ; and there is in reality no more nor reason for timidity or despondency in exploiting It will be noticed that on this supposition the ore deposited in the beds before they were crust foliated ; consequently, by simple exclusion and further argument, the hypothesis that the meta precipitated on ancient lake bottoms which hav been raised and tilted, falls to the ground as fa Mount Read ore bodies are concerned. To ga knowledge of the true nature of the slates and some of the unaltered slate (a dark greasy varie Mount Read was powdered and treated in the t first with a cold saturated solution of citric ac heated, but no effervescence took place. Subsequ ing in HCl. gave the same result. The non-meta schist from the same locality was subjected to t treatment. Some of this behaved in a similar but another piece gave signs of the presence of a c The microscopical test showed calcite. Slides of t in the tunnels of the Hercules Mine sometim abundant calcite, occasionally in a granular con

ten up by earth movements. That minor later ents have occurred is evidenced by the "greasy gs" in the mines. These are false walls, or parting where the rock has been shifted by earth stress. the microscope the powdered schist reveals its ion from the slate very plainly. Both consist of of alumina or aluminium silicate, with a little quartz. hist is perhaps the most common on the Hercules of sections on Mount Read. It is hardly a true hardly even phyllite, which is a lustrous slate. e, or argillaceous schist, would perhaps be the most name. There are, however, other descriptions on ge. There are clay slates, glossy with mica; these phyllites. There are siliceous schists, which have l from the foliation of sandstones; and quartz probably from quartzites; and talc schists, as on piter section, which must have had a different from the argillitic and quartz series. Talc schists st likely to originate from pyroxenic rocks, but is known yet of the relations of the Jupiter rocks. ous schists occur, but not the true mica schists neissose Archæan series. At Cutty Sark, near the River, there is a dark, compact, granular rock, tful origin, which has been involved in the move- of the chain, and received an impress of schistosity. , all through this zone of metamorphism and folia- matter what kinds of rock, they have been caught e process of schist formation, their original characters r less obliterated, and a new stamp of rock structure sed upon them. An exceptional occurrence in the one is the Mount Black lode at Rosebery, which is ed true fissure lode containing gold, wolframite, bor- ismuthinite, chalcopyrite, iron and arsenical pyrite, ck tourmaline. The occurrence of wolframite and line is noteworthy. Just south of this, at the South Black, is a dyke, black with tourmaline. The acid of this dyke and lode seems to indicate some con- with the movements of the granite magma in the Coast area. This relationship naturally involves a younger age than that of the surrounding schists lsites. The tourmaline quartz-porphyry at South n Bell, the axinite at the Colebrook, and the Mount fluor and tourmaline rocks, probably all belong to l the same eruptive phase.

schists are repositories of numerous minerals and hich vary in the extent of impregnation to both es, inasmuch as these are more commonly simply nted by a few sparsely scattered minute crystals kes of pyrites, often of a cupriferous tendency, with nal patches of galena and zinc sulphide. More these metallic minerals are found in great quantity, mes wholly replacing the substance of the rocks, ey assume the character of a dense mass of sulphide enormous extent. It is such masses of mineralised which are operated upon by the miners in the s of Mount Reid and Rosebery. The change does ume a general character, for often within a restricted ne or other of the copper, lead, zinc sulphides derates; but, as a rule, zinc is present. At the nian Copper and adjacent mines the ore is practi- hat of a zinc-copper nature; at the Hercules the ad impregnation is the most pronounced; while at ng River, the East Hercules, Red Hills, and others, is almost zinc free; and at the Mount Read Mine all degrees of admixture may be obtained. A small ty of associated gold and silver is very general, and urable localities for decomposition, where large of gossan have formed, the precious metals have btained in greater abundance, and have in one e been worked by methods common to the alluvial iner. In the workings of the Hercules and South es mines, bunches of crystallised carbonate of man- of great beauty are occasionally met with, and in ists of the East Hercules the ores of bismuth have etected, while in the vicinity of Lake Dora cobalt ls occur; but the ores of these metals are not by ans abundant, and are, as at present known, simply ties of interest to the mineralogist, but of no practical o the miner.

The following is a list of the more important minerals which have been detected :—

Arsenopyrite.	Cuprite.	Limonite.
Absolite.	Chalcocite.	Malachite.
Azurite.	Erythrite.	Psilomelane.
Barite.	Fluorite.	Pyrites.
Bornite.	Galenite.	Pyrolusite.
Bismuthinite.	Göethite.	Rhodochrosite.
Cerussite.	Gold.	Siderite.
Chalcopyrite.	Hematite.	Sphalerite (Blende).
Cobaltite.	Huascolite.	Stibnite.
Copper, native.	Jamiesonite.	Tetrahedrite.

The Mount Read felsite does not appear to have yielded sufficiently to the foliating force to provide planes along which solutions could travel freely, or was not so easily attacked by the latter; hence it contains no ore bodies. This is not, however, a universal rule. At the Red Hills an igneous rock, probably felsite, occurs, which has been more strongly foliated, and, in a specimen received from the Government Geologist (*see* Report on Lake Dora District, 1898, p. xxi.,) we noticed a decided illustration of the replacement process. A few felspar crystals remained unaltered, but the rest of the rock had been converted into hematite. But at the Mount Read mines the ore is confined to the argillitic schists. The question arises, whether the proximity of the igneous rock bears any casual relation to the ore in the schists—has the eruptive rock in any way stimulated ore deposition? An answer in the affirmative would have a practical effect on mining, as the discovery of felsite would indicate the proximity of ore. The case of the white melaphyre at Zeehan, which favourably affects the silver-lead lodes there, suggests the possibility of something similar ruling in the case of the Mount Read felsite. But the two cases are not parallel. At Zeehan the lodes in question traverse the eruptive rock; at Mount Read the ore bodies are outside it. And it is difficult to see how the latter would affect ore deposition in the schists, when, as appearances indicate, the ore was deposited subsequently to the foliation and metamorphism of both felsite and schist. It is true that ore is found never very far away from the felsite. A very natural way of accounting for this is that schists and felsite are geographically associated, and form together one mountain complex.

Age of the Felsite.

If our interpretation as set forth above be correct, the geological age of the schists and felsite is the same for both. There is no direct evidence of precise age yet available. The schists themselves in the vicinity of Mount Read are argillites and phyllites, and occasionally retain in places less altered remnants of slate, but no fossils have been found in them. The most recent determinative work done in this direction is R. Etheridge, jun.'s description of Mr. A. Montgomery's collection of Silurian fossils from the limestones of Zeehan and the Heazlewood. Mr. Etheridge says they "present both a lower and an upper Silurian facies, but with a preponderating tendency towards the latter." He thinks "it is not improbable that they represent a series of beds homotaxially equivalent to the lower portion of the upper Silurian."* Judging from the succession, the Mount Read and Mount Black schists are somewhat older than the Zeehan series, and are probably not younger than the lower Silurian. But great caution is necessary here, as the evidence is of a negative character. The test of superposition is unreliable, as the persistent easterly dip of the strata on the west slope of Mount Read points to overfolding on a large scale, which has produced an inverted succession of the beds. In any case, the felsite is much older than any of our known granite rocks.

Determination of the Felsite.

Anticipating for a moment the results of our microscopical examination, we may say that the predominance of plagioclastic porphyritic felspars led us to suspect that the rock belonged to the sub-group of soda felsites or keratophyres (in their altered sheared form often called porphyroids). To avoid all chance of error, we sent samples of the rock to Professor Rosenbusch, who very kindly

* Description of a small collection of Tasmanian fossils.—R. Etheridge, jun

favoured us with his opinion, as follows :—"Undoubtedly we have here strongly dynamically altered forms of the acid eruptive rocks. The typical porphyritic structure, the nature of the phenocrysts, the still recognisable fluidal structure, the nearly entire absence of dark constituents, the occasional spherulitic forms still recognisable in their replacement products (quartz, albite), all point with certainty to members of the quartz porphyry family, and, with great probability, not to quartz porphyry in the narrower sense, but to quartz keratophyre and keratophyre. . . . . The rocks greatly resemble our German occurrences in Westphalia, the Fichtelgebirge and Thüringen, and especially the occurrences in Wales. These are the forms which in Germany were originally called porphyroids and flaserporphyries."

Microscopical characters of the Felsite.

As the aspect of the rocks differs in the field in different parts of the same mass, so their microscopical structure varies to an equal extent. Sometimes they are typically porphyritic, though the crystals are never very large ; or the porphyritic crystals are set so closely together as to resemble somewhat a plutonic rock-like granite ; or they are broken and mutilated, giving a fragmentary appearance to the rock. The mineral constitution, too, varies. There is a set in which quartz phenocrysts accompany those of felspars, and another series from which they are absent. Nevertheless, despite all these variations, the observer recognises that he is looking at one and the same group, the acid and the sub-acid eruptives.

The mineral constituents of one or other of the members of the group may be classed as under :—

Essential.	Accessory.	Secondary.
Orthoclase.	Magnetite.	Albite.
Oligoclase ?		Chlorite.
Albite.		Epidote.
Quartz.		Sericite.
		Calcite.
		Limonite.
		Sphene.
		Zoisite.

The changes are all rung on these minerals, the secondary ones replacing or obscuring the essential constituents in varying degrees.

In addition to orthoclase, a felspar of the albite or oligoclase-albite series appears as a porphyritic constituent, and is sometimes very abundant, becoming the prevailing felspar. This shows us that these are not the ordinary orthoclastic felsites.

The material upon which we have founded these preliminary microscopical studies comprises an extensive series of rocks collected from Mount Read, on the sections owned by the South Hercules, North Hercules, East Hercules, Crown Hercules, and Ring River Companies, from Tipperary Creek on the west side of Mount Read, from the White Spur between Dundas and Mount Hamilton, from the Tyndal Track and Creek south of Mount Read, from the Red Hills east of Mount Read, from Mount Black and the Tasmanian Copper Company's property north of Rosebery, &c. The following micro. details will be of interest to students :—

We note that in the porphyritic types on the North Hercules section the felspars have a habit of collecting in nests, and there is a good deal of water-clear secondary felspar surrounding the phenocrysts. The phenocrysts float in a matrix of this secondary felspar, with which calcite is sometimes associated. Carlsbad twins may be often seen bent by dynamical stress, and strongly seriticised. In the more granitic or crystalline forms, on this property, there is abundant quartz, which often has a fragmentary aspect, being in all sorts of irregular shapes. Hexahedral forms are rare. Some of the grains are embayed ; others are stretched, cracked, or broken. Strain shadows are frequent : minute fluid cavities present occasionally. Between the felspars there is a good deal of bright green chlorite. Sericitic streaks curve between the phenocrysts ; this may represent original flow structure. The rock on the White Spur is a counterpart of that of the North Hercules. The crystalline form is the dominant type. Fragmentary deformed quartz frequent. Schistose structure marked ; the lines of schistosity bend round the unyielding quartz grains, causing a streaky appe and probably marking former flow lines. The o porphyritic form of rock also occurs on the White S

In the keratophyre of Tipperary Creek the felsp strongly sericitic, and the rock is veined with albite felspar veining occurs also in the same rock at Re in which there are rather peculiar nests of albite c The keratophyre here is rich in bright green chlorit the Tyndal Creek there is a rather fresh keratophyr a good deal of chlorite. On the track to Mount Tyn felsite is much epidotised ; some of the Carlsbad twi one half replaced by epidote, and chlorite is de abundantly. The felspars of the keratophyre in th River adit have been replaced by aggregates of sec albite and quartz ; the crystals of felspar here have s fields very characteristic of keratophyres. There is a phyre on the Crown Hercules overlying the ore bod slate on both sides. At the Mount Black mine the in keratophyre, identical with that of Mount Rea porphyritic felspars are here, too, surrounded by se felspathic growth. Further north, on the Tasmanian Company's property, there is a band of felsite in th adit 40 feet wide, in which the few felspars are br into aggregates of secondary albite. With referenc groundmass of these rocks, Professor Rosenbusch w us :—"Nothing is left of the original groundmass been converted into sericite, quartz, and albite. The formed albite felspar can be distinguished quite easi the older phenocrysts. The chlorite indicates pyroxene rather than biotite."

Summarising the above, we have here the charac of felsite and quartz felsite, and especially of kera and quartz-keratophyre. The rocks have a compact felspathic (felsitic) groundmass, with quartz and or and albite phenocrysts, sometimes distributed spari other times so crowded as almost to lose the por stamp. In the typically porphyritic varieties are spherulites and signs of flow structure. In a wor are ancient, now devitrified, lavas of the alkali-gra alkali-syenite families. The quartz keratophyres granite volcanics ; the keratophyres are of syenitic

There are no plutonic masses in the neighbourhc which we can connect this series of lavas. The which occurs in boulders north of Rosebery, has n found *in sitû* ; and the granite at Heemskirk is of date. There is some pegmatitic granite on Jolly's at Lake Dora, which microscopically appears fr post-Silurian. The mass or dyke of syenite por Lynchford is evidently of great age. The me deformation of its crystals indicates that it was s to the same earth movements as the slates ; and consequently a likelihood of it being quite as ol felsites. The long line of felsite, with its axial parallel with that of the West Coast range, shows th that area, in Silurian times, there must have been sponding plutonic body of rock, which the vast p post-Silurian denudation has not been sufficient to

Mr. W. F. Ward's Analysis of Quartz-keratophy the North Hercules Section, Mount Read.

Professor Rosenbusch suggested to us that a analysis of this rock was highly desirable, in confirm the results of optical examination. This has been made by Mr. W. F. Ward, Government who states it as follows :—

Constituents.	Per cent.
Silica.....	75·73
Alumina.....	12·70
Oxide of iron.....	2·25
Lime.....	2·00
Magnesia	0·60
Potash.....	2·04
Soda.....	3·48
Loss at red heat.....	1·20
	100·00

From the above it will be seen that the refe quartz-keratophyre is fully sustained. The perce silica shows it to be an acid eruptive, while the soda over potash indicates the keratophyre group.

REPORT ON THE ALLUVIAL TIN MINES AT DERBY.

Mines Office, Launceston, 1st May, 1899.

SIR,

In accordance with your instructions I proceeded to Derby on the 8th ultimo to examine the alluvial tin mines in that vicinity, but owing to other pressing engagements I was unable to make a complete examination, and shall have to return when opportunity offers to finish the work. In the meantime I have the honor to forward you the following interim Report.

The Town of Derby, which is largely dependent on the mines, is situated at an elevation of about 400 feet above sea-level on the Ringarooma River, distant about 23 miles by road from Scottsdale. At this point the river has cut through what is known as the Brothers' Home or Cascade Deep Lead, a thick deposit of stanniferous gravels of Palæogene age, capped with basalt, and filling the valley of an older river corresponding to the present Cascade River. To the north of Derby is an extensive basaltic plateau of rich agricultural land, under which doubtless runs the main lead corresponding to the present Ringarooma River, of which the Cascade is a tributary.

The formation of the deep leads of Tasmania has been fully described by Mr. A. Montgomery, M.A., late Government Geologist, in his Reports on the Gladstone District, on Thurean's Deep Lead, &c., but it may be well to here briefly recapitulate the principal points.

In early Tertiary times the general level of northern Tasmania, irrespective of the great denudation that has since taken place, stood considerably higher than at present. Of this we have abundant evidence. The bottom of the Launceston Tertiary Basin, for instance, has been proved by boring to be at least 200 feet below sea-level. The bottom of the Ophir Deep Lead at Beaconsfield is over 270 feet below sea-level, and the Deep Leads at Lefroy and Back Creek also run well below sea-level. The ancient rivers were then engaged in carving out their valleys, the scouring action of the water being probably increased by a gradual elevation of the land. Then followed a long period of subsidence, which caused a decrease in the grade of the rivers, and, instead of wearing their beds deeper, they began to deposit their burden of detritus, and thus the old valleys became filled to a considerable depth with gravel, sand, &c. As the land subsided the sea naturally encroached further and further inland, and remains of Tertiary marine beaches are found on the slopes of Mount Cameron and elsewhere. At the close of this period of subsidence there was a period of great volcanic activity, when showers of ashes and streams of lava were poured forth, which filled up the valleys and diverted the streams from their courses. Then the land rose again, probably slowly and gradually, and the rivers began to carve out fresh channels following the general direction of the older streams, but sometimes cutting right across them, as in the instance under consideration. Here we have a deposit of gravel and sand, in places over 150 feet thick, which has been buried beneath a thick covering of volcanic ashes and basaltic lava to a depth of over 150 feet, and so preserved from denudation except where cut through by the modern streams. It is evident that there were several outbursts of lava at considerable intervals, as we find layers of gravel with basalt below and above.

The wash consists almost entirely of quartz, ranging from pebbles the size of sparrows' eggs down to fine sand. Colourless topazes are not uncommon, and black spinels are frequently seen. These latter are sometimes mistaken for tin-ore, but may be readily distinguished by their superior hardness and lower specific gravity. In the lower drifts, as proved by boring, there is a good deal of carbonaceous matter, and pieces of lignitized and silicified wood are sometimes found in the basalt. Occasionally there are layers of pug or clay, and in places the gravel is so cemented together with silica and oxide of iron as to require the use of dynamite to break it. This is particularly the case in the Briseis workings, of which further mention will be made later on. The bed-rock, wherever exposed, consists of coarse grayish granite with large porphyritic crystals of felspar, which weathers very rapidly. A good deal of the wash has been formed from the direct disintegration of the granite, which probably carries a little tin throughout, but much of it is coarser than the quartz seen in the granite, and has doubtless come from quartz lodes; but the tin-ore is as a rule fine, and I have not heard of any specimens being found with quartz attached. In several places, however, I noticed small veins of quartz traversing the granite, and the discovery of some rich tin-bearing lodes has lately been reported near the head of the Cascade River. The mines at present working on the Cascade Lead are the Krushka Brothers, New Brothers' Home No. 1, and Briseis on the south side of the Ringarooma, and the Brothers' Home Extended on the north.

Brothers' Home Mine.—This is a private claim owned by Messrs. Krushka Brothers, to whom is credited the first discovery of tin in this locality. It is contained in Mineral Section 316, of 80 acres, extending from the Ringarooma River in a southerly direction up the lead for a distance of about 35 chains, bounded on the south by the New Brothers' Home No. 1 Mine, and on the east by the Briseis.

For some distance up the lead from the river there was comparatively little wash above the drainage-level, the present river having cut out and sluiced away a large piece of the old lead; but there is a considerable depth untouched below this level, borings on the North Brothers' Home (now Brothers' Home Extended), on the opposite side of the Ringarooma, having proved the bottom of the old channel to be over 70 feet below the present river. For about 20 chains from the river the gutter runs in a south south-westerly direction, when it takes a sharp bend round to the S.E., and the ground gradually becomes deeper, the present face being about 280 feet high, of which about half is basaltic overburden and half drift. The upper part of the face consists of decomposed basalt, which is succeeded by about 50 feet of hard columnar basalt resting on a thick layer of basaltic tuff. The bottom of the face is close up to the southern boundary, and only a comparatively small patch remains to be worked in the south-eastern corner of the section. It will be impossible to work out the whole of this without bringing down very heavy falls of basalt from the Briseis and New Brothers' Home No. 1 Companies' properties, and encroaching on their top drift. The hill above the face is seamed with cracks caused by the subsidence, due to the underground workings of the adjoining mines, and as the gravel is sluiced away from the bottom occasional big slips of the basaltic overburden take place. These slips always give good warning, and, as there is a good get-away for the men, there is very little danger with ordinary care. The boundary-line between this claim and the No. 1 is marked by a wire stretched from the top of the cliff, the original surface having long since disappeared. Much of the basalt is so decomposed as to be readily broken up by the jet of water from the nozzle, but the more solid stones have to be carted away some distance to be dumped. The tail-race has been brought up as flat as possible, and Mr. Krushka informed me that it was only about 6 feet above the actual gutter at the face, so that there must have been a great fall in the old channel between this point and the river. Owing to the silting up of the river at the outlet, it is difficult to keep the tail-race clear, and a sort of plough is occasionally dragged along it with good effect. The top 50 feet of drift are very poor in tin, and not considered payable, but towards the bottom it becomes much richer, and the last 20 feet are very good. This is only as might be expected, for when the lower gravels were being laid down the channel was comparatively narrow, and the velocity of the stream was such as to carry the lighter gravels forward and admit of some concentration of the tin ore. As the land subsided the stream became wider, its velocity was consequently decreased, and, being overloaded, it would deposit its burden much more rapidly, the carrying power of a stream being reckoned to vary as the sixth power of its velocity. The upper gravels would therefore represent a considerably less degradation of the surface than the lower ones. In the gutter itself are found large boulders of granite (generally decomposed), and round these the drift is usually exceptionally rich.

Both the eastern and western reefs (a "reef" is the miners' term for the sloping bed-rock) are exposed a short distance from the face about two chains apart, and the gutter appears to be turning more to the south.

The top part of the race is cleaned up about once a month, and the rich sand is carted a short distance to the tramline, tipped into trucks, and run down to the tin-sheds near the river, where it is streamed in boxes, dried, and bagged. No figures of the output prior to 1883 are available, but from 3rd July of that year up to 31st March, 1899, 3791 tons 11 cwt. of tin ore, assaying about 74 per cent. of metallic tin were obtained,—a magnificent result, considering the area of the ground worked, and very encouraging for the working of the deeper gravels higher up the lead. The present output is about 10 tons per month.

New Brothers' Home No. 1.—This company possesses an extensive property of 220 acres, but the main workings are confined to Section 554 of 80 acres, situated immediately south of Krushka Brothers' claim. It was originally worked from a main inclined drive by drifting and blocking out successive layers of the washdirt, and in this way a block of ground from 40 to 50 feet deep, about 700 ft. long, and up to 300 ft. wide, extending to the Briseis boundary, was worked out. This system of working such a large body of drift is very expensive, owing to the immense quantity of timber required and the cost of hauling the dirt to the sluice-boxes, and it is impossible to work out the whole of the ground. A good profit was, however, made for some time, and the bottom of the gutter had not been reached when underground operations had to be suspended owing to the damage caused to the Briseis Company's main tail-race drive. A start was then made to strip off the heavy basaltic overburden, and an immense qnantity of solid basalt was removed by manual labour, the softer portions being broken up by the hydraulic jet and sluiced away, but the old tail-race was too high to command the best of the drift. By arrangement with Messrs. Krushka, a new tail-race about 34 chains in length has been constructed through this section, striking the western reef near the boundary between the two sections, and most of the wash lying on the western reef, from which the overburden had been previously removed, was sluiced through this. The drift treated yielded about 3 lbs. of tin ore to the cubic yard, although much of the best of it had been previously blocked out, and sluicing was much hampered by the timber of the old drives. Further to the east, towards the centre of the lead, very good seams of tin ore are showing, the

best of it being below the present tail-race, which is about 35 feet above the bottom of Messrs. Krushka's face, but it would be impossible to work this at present without bringing down large falls of basalt into the Krushkas' workings. Last year tenders were invited for removing 100,000 cubic yards of the overburden, and an offer was made to do this for 1*s.* per yard, but the tender was not accepted. Over the centre of the gutter there is about 140 feet of overburden, a large part of which is solid columnar basalt, but the hill slopes towards the western reef, and on this side the basalt is more decomposed. A cut is now being made through this to the south, the stripping being removed at the rate of about 2000 cubic yards per week, which Mr. Whittle, the manager, informed me cost only about *5d.* per yard. This will probably uncover a good deal of payable drift, but the best of it will still be inaccessible. The stuff is first broken down by a giant nozzle with a pressure of over 200 feet. The solid stones are separated out by a large perforated plate placed in the tail-race and sent over the tip, the smaller stuff being carried down the tail-race and discharged into the river, and the largest stones, which are too heavy to be moved by the water, are trucked from the face, but operations are very much hampered for want of a convenient dumping ground. There is still a point of drift carrying very good tin remaining on the western reef on Messrs. Krushka's ground near the boundary, and if this were removed there would be good dumping-room for a long time to come. Some time ago an offer was made to the No. 1 Company allowing them to sluice away this gravel on condition of giving up half the tin, but the offer was refused; now, Messrs. Kruskha require all the tin, and, as a convenient dumping-ground is absolutely necessary for economical working, the No. 1 Company would do well to accept this offer. One great drawback to this company is the want of an adequate and permanent water supply. At present the main supply is drawn from what is known as the Cascade Water Trust Race, belonging jointly to the No. 1 and Briseis Companies. Under an agreement between the two companies, when the water in the race exceeds 16 sluice-heads the No. 1 is entitled to receive and use 8 sluice-heads and the Briseis takes the balance, but when the water in the race falls below 16 sluice-heads the No. 1 Company is only entitled to 8 heads for 16 hours in each day, viz., from 4 o'clock in the afternoon till 8 o'clock in the morning, the Briseis Company being entitled to the excess over 8 sluice-heads during these hours, and to the whole of the water in the race during the remaining 8 hours, from 8 in the morning till 4 in the afternoon. The Kruskha Brothers have a prior right to 5 sluice-heads lower down the stream, and, consequently, when the available water in the Cascade River falls below this neither the Briseis nor No. 1 get any. The Briseis Company pays two-thirds and the No. 1 one-third toward the maintenance of the race, rents, &c. The No. 1 Company has lately applied for a water-right of 15 sluice-heads from the Ringarooma River, which, it is estimated, can be brought in in a race about 16 miles long. They have also applied for 8 sluice-heads at the junction of the Cascade and Ringarooma Rivers, and it is proposed to pump the water up to the mine. A Tasmanian sluice-head, it may be mentioned, is the quantity of water passing through an aperture 16 inches wide and one inch deep in the outlet, and of a horizontal gauge-box 12 feet long when the surface of the water is six inches above the centre of the aperture, and is approximately equivalent to 150 gallons per minute. To the south of the main workings there is good tin showing in shallow wash belonging to a more recent deposit along the courses of several small creeks, but the only outlet for the tailings at present is through the Briseis Company's main tail-race, and the ground cannot be worked without the consent of the latter company.

Briseis Mine.—This property, comprising Sections 452, 453, 454, 455, and 627, with a total area of 178 acres, is bounded on the west by the Krushka Brothers claim and the New Brothers' Home No. 1 Mine, and on the south by sections belonging to the latter company. It embraces the whole of the upper end of the lead, the granite which forms the rim rock on both sides of the original channel outcropping within the company's boundaries for over half a mile in length, and the lead runs out altogether in Section 454. Owing to its position it has been a very expensive mine to open up, the total expenditure up to date being approximately £190,000, and the tin-ore obtained up to 31st March, 1899, yielded 730 tons of tin, worth £51,293. The natural outlet through the Krushka's claim being precluded, it was necessary to drive a tunnel through the rim rock to tap the lead. This was started in November, 1884, and driven about 1200 feet through solid granite to the edge of the lead, and thence continued in the drift a further distance of nearly 1100 feet. From the mouth of the tunnel to the river there are over 10 chains of fluming, so that the total length of the tail-race is about 3000 feet. The tunnel, which is about 8 feet wide and 6 feet high, runs for the first 1000 feet in a S.S.E. direction, but the edge of the lead not having been reached where expected, it was curved round to the S.S.W. until the drift was cut. It was originally intended to open out here to the surface, and at the same time to continue the main tail-race drive in a south-easterly direction to what was known as the ABC Flat, where the overburden was much lighter, the greater part of the basalt having been denuded by natural agencies. With this object, stripping was started on the northern side of the main basalt hill to the east of the Krushka's workings, and a very large quantity of basalt was removed; but, owing to the deviation in the tunnel, the point where the edge of the lead was struck was only about a chain from the western boundary of Section 455, and as the stripping at the highest point would be nearly 150 feet deep, it was decided to abandon this for the present and concentrate all the water-power in stripping a large area on the ABC Flat and open out there. Near the top of this northern stripping face a layer of gravel, mixed with basaltic clay, is seen, which is said to carry a little tin, and drift at a

corresponding elevation is found at several places further south, where the top layer of basalt has been denuded. These gravels were laid down during a period of quiet before the last outbursts of lava, which finally diverted the river from its course. At the end of the rock tunnel a large chamber was cut in the granite in which sluice-boxes were set, and a good deal of driving was done in the wash, but most of the old drives have been filled in, and it is difficult to see what they disclosed. Much of the drift was very fine, and the drives had to be very closely timbered to prevent it running.

The following particulars of the work done are largely taken from old plans and the half-yearly reports kindly placed at my disposal by Mr. Edgell :—

It was intended to keep the main tail-race along the eastern edge of the lead, and a large drive was started from the end of the rock tunnel in soft granite, bearing about S.S.E., but after going about 250 feet in this direction it was found necessary to curve the drive round to the south on account of meeting a spur of hard granite, and it was finally abandoned at 318 feet, the end being all in granite. This is probably the continuation of the granite which outcrops on the surface further south, near the old locomotive shed, and runs thence in a south-easterly direction, forming the eastern reef of the main lead. To the east of this old tail-race drive connection was made with the surface by means of an inclined drive about 470 feet long, which is still open, and is used for taking timber, &c. into the tunnel. It is said to have been driven all in drift until the basalt was reached, and it is most probable that this belongs to a branch lead coming in from the south-east.

A rise was put up 10 feet above the tunnel-chamber, and a horizontal drive carried to the south at a distance of about 55 feet from the western boundary of the section, to which several short crosscuts were driven in the wash. Granite bottom was touched at 560 feet, and a drive was then brought up to join on from the floor of the chamber on a rising grade of 2 feet to the chain, and continued with this grade in a southerly direction, bearing round to S.S.E. along the edge of the lead to connect with a shaft sunk at the lower end of the flat. The wash-dirt obtained from these drives and crosscuts is said to have averaged about one per cent. black tin, but at the lower level several bands of cement were met with. Communication having been thus established with the surface, the work of opening out was begun by sluicing away the gravel round the "dump shaft," a large paddock having been previously stripped of the basaltic overburden. A branch from the main tail-race drive was also driven over 300 feet, and connected with a second "dump shaft," lying about 200 feet south of No. 1. In this way a very large excavation was made, but unfortunately it was found that overlying the drift at this part there was a layer of hard cement, in places as much as 15 feet thick. This had to be broken up with hammers, or by means of explosives, and as it could not be sluiced down the tail-race it had to be stacked out of the way, largely increasing the cost of working, besides considerably hampering sluicing operations. Beneath the cement at the No. 1 shaft there was about 70 feet of free drift, the top portion of which was almost barren of tin; but it improved with depth, and below this there were alternate layers of cement and free drift for about 19 feet to the bottom. For some time the lower cement formed the sluicing-level, but eventually an open cut was made through this down to the level of the tail-race drive, and at the head of this the sluice-boxes were set. This is the lowest point which can be commanded by the present tail-race drive, but prospecting shafts have proved that the gutter of the lead is at least 20 feet below this. The cement bands were doubtless formed by chalybeate waters, brought down by several small creeks which joined the main stream from the south and west, and as work advanced up the lead they gradually cut out, but similar bands are likely to be found at intervals higher up the lead. The cement contains a little tin, and also a little cobalt mixed with oxide of manganese in the form of asbolite, but is not rich enough to pay for crushing.

Sluicing the tin-drift was started in 1890, and has been carried on since then with frequent interruptions, owing to insufficiency of water. To economise water, and expedite the removal of the overburden, a complete steam-stripping plant was purchased early in 1891 at a cost of over £4000; but this seems to have been more or less of a "white elephant," and the money would have been much better spent in augmenting the water supply.

From the boxes the eastern, or rather the northern, reef—for the gutter runs nearly east for some distance and then bends round to south east—has been laid bare for about 13 chains in length; and to the south the overburden has been removed to an average width of about a chain and a half for a length of about 9 chains, the portion stripped running approximately east and west. The basalt varies from 30 to 65 feet in thickness along this face, but becomes thicker to the south and east. It is partially decomposed, and is readily broken up by the jet from a 4-inch nozzle under a pressure of about 220 feet, most of it going down the tail-race, but occasional undecomposed kernels occur which have to be shifted by hand, and from surface indications it seems probable the basalt becomes more solid going south. Immediately under the basalt is a layer about 10 feet thick of stiff pug or clay quite free from grit, which is more troublesome than the basalt: the water simply bores holes into it, and it has to be broken up small with picks or mattocks before it can be sluiced away. Partly surrounded by the pug and resting on the drift, I noticed in places large boulders of rotten granite, some of them as much as 20 feet in length. It is quite impossible that these could have been brought into their present position by the action of the water, the presence of the pug showing that at that time the water was very still. Probably prior to the outpouring of the basalt there were extensive earth tremors, and these boulders rolled down from

the surrounding hills, which at that time were considerably higher than at present. Similar boulders are seen in the lower part of the Cascade River, and on the steep sides of the valley there are numerous boulders of all sizes up to huge tors, which are simply the result of the weathering of the granite.

At the time of my visit a low level tail-race, 6 feet wide, with a fall of 2 feet 6 inches to the chain, was being constructed, which will command about 50 feet of drift at the point where it is intended to start sluicing about 4 chains from the boxes. Just below this point a large quantity of basaltic *débris* and tailings was passed through, filling up a paddock which was lifted by a former manager. No particulars are available as to the size and depth of the paddock lifted, but the drift is said to have been very rich, and over 100 tons of tin ore were obtained from a small paddock.

The drift shows frequent instances of false or current bedding, pointing to the fact that it has been laid down in shallow water. The top 30 feet are very poor, but it gets richer going down, and in places near the bottom of the face very rich seams of tin-ore can be seen. These, however, are very wavy, and cannot be relied upon to continue far in any particular direction: thus it happens that a face may be showing very rich dirt, and a few feet further in on the same level the drift may be quite poor, and *vice versâ*, so that it is extremely difficult to form an estimate of the average value of the drift. A large portion of that already sluiced yielded only from 1½ to 3 lbs. of black tin to the cubic yard, but at the present high price of tin, even this low yield should give a good profit, and there is reason to expect that the drift will be richer towards the head of the lead. The present local quotation for tin-ore is 20*s.* per unit, the London market price for Australian tin being £117 10*s.* per ton. The ore from all the Derby Mines is very uniform, and can be readily dressed up to 74 per cent. tin without much loss. Thus the dressed ore is at present worth £74 per ton in Launceston, or, allowing 30*s.* per ton for cartage to Scottsdale and railway freight from there, £72 10*s.* on the mine. This is equivalent to about 7¾*d.* per lb., so that a yield of even 1 lb. to the cubic yard should more than cover the cost of stripping and sluicing. This is of course not taking into account the drift below the level of the present tail-race drive, which wherever tried has proved very much richer than the upper layers, and in this lies the wealth of the mine. Probably the best way to work this would be by hydraulic elevators, but before this is started, it would be advisable to get well ahead with the sluicing of the upper drift down to the lowest level possible by the present tail-race drive, and then sink a series of prospecting shafts or bore holes across the lead to ascertain the position and average inclination of the gutter, which at present can only be guessed at. The stripping must be kept well in advance of the sluicing, which should go on night and day, and for this purpose a better water supply is absolutely necessary. Until recently the main supply was drawn from the Cascade Trust Race, under the conditions explained in speaking of the New Brothers' Home, No. 1 Mine, and in dry seasons work had sometimes to be almost entirely suspended for several months. Last year a race over 6 miles long, carrying about 12 sluice-heads, was constructed from Main Creek, at a cost of about £2600, and the water is conveyed to the face by a 20 inch column, 29 chains long, under a head of about 230 feet. This has proved of great assistance, but cannot be relied upon in the summer. Some ten years ago a survey was made for a race to bring in 60 sluice-heads from the Ringarooma River, a distance of 22 miles, at a cost of £22,881, but it is said that the race could be shortened 8 or 9 miles by cutting a short tunnel through a ridge, and brought in at a considerably higher elevation, which is of great importance owing to the extra pressure gained for stripping and elevating purposes.

At present there is only one stripping nozzle at work, which discharges into the Cascade River by means of a tail-race cut through the intervening granite ridge. This should be deepened so as to command the whole of the stripping, it being necessary at present to send the bottom 12 to 15 feet down the main tail-race, which should be reserved entirely for tailings.

An electric light plant with several arc lamps is also required, and would greatly facilitate work at night. The dynamo could be worked by water, which could afterwards be used for flushing the main tail-race. With several faces constantly going, and the consequent larger quantity of water and tailings, it would be necessary to enlarge the fluming in the upper part of the tail-race drive, and the drive could be straightened with advantage. The rock tunnel has a very uneven grade. It is too wide for the present water supply, and has to be carefully watched to prevent it silting up; but this would be obviated by a larger water supply.

South-east of the present workings the ground rises for some distance, and provision will have to be made for the removal of considerable quantities of solid basalt, which here forms the capping. A good deal of work was done by tributors some years ago all over this hill on the later drift, much mixed with basaltic clay, which is found enclosed in the basalt. Occasional patches of cement are seen, and it may be expected that this will be also found in the lower drift underlying the basalt. To the east of the hill is a flat four or five chains wide, separated by a ridge of granite from the present Cascade River, which here runs in a general north-westerly direction on the bare granite. Two prospecting shafts were sunk on this flat about a chain apart over twelve years ago, and are said to have passed through very good tin drift. The first shaft bottomed at 69 feet, and passed through 26 feet of drift, 16 feet of which was estimated to contain 20 lbs. of ore to the cubic yard. The second shaft reached a depth of 100 feet without touching bottom, when water became too heavy to sink further. It passes through 3 feet of cement and 53 feet of drift (including 13 feet soft granite boulder), and the bottom, 46 feet, was estimated to average 40 lbs. of ore to the cubic yard. These figures are taken from the company's half-yearly report for the half-year ending 30th November, 1889, the shafts being now full of water.

Four or five chains further east the basalt cuts out altogether, and the bare granite crops out all round. so it is obvious that there must have been a very abrupt fall in the original stream at this point. The only outlet for this drift is down the old gutter, but it will be many years before the workings advance thus far. Lower down the Cascade the valley widens out, and the shallow modern deposit of the present river has been worked in places several chains in width. For some distance the river has been flumed to act as a tail-race; in places towards the lower end of this it appears to run on a false bottom, and it is quite likely that drift will be found beneath this belonging to the branch lead before mentioned as joining the main lead from the south-east. It is not likely, however, to be very deep here, as the distance between the solid granite outcropping on either side is only three or four chains in the widest part, and this rapidly decreases going up the stream, but further west there is a flat several acres in extent, bounded on the west by the main basalt hill and on the south by the ridge of granite mentioned as outcropping near the old locomotive shed. This flat is covered with a recent deposit of tin-bearing wash, and the surface has all been worked over, and yielded a good deal of tin; but, as far as I could learn, the bottom was never reached, and as there is likely to be deep ground here, it would be well worth while testing by boring or sinking.

It is a great pity that arrangements could not have been made at the first start to amalgamate with the Krushka Brothers and No. 1 Brothers' Home Company, as this would have been to the mutual advantage of all three, and large sums of money would have been saved. The Briseis, however, has at last, after many difficulties, obtained a fair start, and with an adequate water supply and systematic work should be a regular producer of tin-ore for many years to come.

I have the honour to be,
Sir,
Your obedient Servant,

J. HARCOURT SMITH, *B.A.*, *Government Geologist.*

W. H. WALLACE, *Esq.*, *Secretary for Mines, Hobart.*

ON MESOZOIC DOLERITE AND DIABASE IN TASMANIA.

BY W. H. TWELVETREES, F.G.S., AND W. F. PETTERD, C.M.Z.S.

The following Notes lay no claim to be an exhaustive scription of our familiar "diabase" or "dolerite" rock, hich plays such an important part in the geology and ysical configuration of our Island. The present object is ther to place upon record some inferences drawn from the amination of numerous microscopical sections of speci- ens collected or received from all parts of Tasmania. It by accumulating the results of observations that stepping tones are formed to more complete knowledge. A glance Mr. R. M. Johnston's geological map of Tasmania, issued y the Lands Office, will show the share this rock takes in e structure of the Island. It occupies the whole upland ea of the Central Tiers. On the northern face of the iers—the Western Tiers as they are here called—there is tongue of the rock prolonged northwards past Mount laude. At their north-west corner it forms or caps ountains, such as Cradle Mountain (the highest in Tas- ania), Barn Bluff, Mount Pelion West. Eldon Bluff orms a narrow western extension. Mount Sedgwick is a estern out-lier; Mount Dundas another. In that part of e island it is also found at Mount Heemskirk Falls, and n the Magnet Range, two miles north of the Magnet ine. Mounts Gell and Hugel are also western out-liers. s south-west boundary is Denison Range, with Mount ield West, Mount Mueller, and Mount Picton. Southerly e find it in the Hartz Mountains; the rock goes down to e south as far as the Rivers Huon and Esperance, and en further south it is found on the isolated peaks of La erouse and Adamson's Peak, and a narrow fringe of it uns along the coast-line south of the Huon to South East ape and South Cape. On Bruni Island it is present in a very massive form. It is found on Tasman's Peninsula, and in the whole of the south east of the Island it cuts up the sandstones and shales of the Permo-Carboniferous and Trias-Jura country. Mount Wellington and other heights near Hobart have summits composed of this rock. From the eastern side of the Central Tiers it is continued to the Eastern Tiers and the hilly ground from Swansea north- wards to St. Mary's. Ben Lomond, the Mount Nicholas Range, Tower Hill, Mount Victoria, and Mount Saddle- back are north-east out-liers fringed with Permo-Car- boniferous and Jura-Trias. The northern extension passes under the sands and clays of the Launceston Tertiary basin, and re-appears along both sides of the River Tamar. It extends to Mounts Barrow and Arthur and Ben Nevis. There is an isolated patch of it at the mouth of the Mersey and at Port Sorell. On the East Coast it abuts on a fringe of granite on Maria Island, Schouten Island, and Frey- cinet's Peninsula.

A peculiar feature is the almost invariable association with it of Permo-Carboniferous and Trias-Jura beds. The whole periphery of the area forming the Central Tiers is fringed with a narrow zone of these beds, and the same holds good in the case of all the isolated peaks. How can this association be explained? It has been suggested that dolerite capping has protected underlying sediments, and that the latter do not merely hang on the flanks of the igneous table-land, but actually lie beneath the eruptive capping, as the lower formations would do in the case of a sill. The few boring trials which have been made in different parts of the Island lend no support to this suggestion. They have been made through the Permo-Carboniferous and Trias-Jura beds, and traversing these, have penetrated into the dolerite below. On the other hand, no trial has been made of boring through dolerite at surface with a view of reaching the coal m sures: as a matter of fact, we do not know whether rock on the Tiers is a denuded intrusive sheet, conceal sedimentary rocks below it, or whether it is a v eruptive mass *in sitû*. The thickness in other parts of island makes it difficult to believe that it is an intrus sill. The thickest sill we can find mentioned in geologi literature is the sill of basic rock in the Shiant Isles, Scotland, described by Sir Archibald Geikie* as showin sea-wall 500 feet high. But even this surprising thickn falls below the development of the massive rock wh occupies the upper part of Mount Wellington. At same time numerous minor intrusions in the form dykes penetrate the Permo-Carboniferous and Trias-J sedimentary beds, so that we have two rather clear ty of occurrence. Mr. R. M. Johnston places the geologi horizon of this rock at the close of the Trias-Jura syste and we have no doubt in this his opinion is approximat correct. The rock has never been found *in sitû* in any our Tertiary beds, which, however, do contain inclu fragments of it. The microscopical appearances of spe mens from widely distant parts of the island also supp the inference that the rock all over the Colony belongs one and the same geological age. In one instance we h noticed microscopical fragments of the dolerite (diaba included in Tertiary olivine-basalt. This occurs n Bothwell, where the basalt probably has entangled in flow loose pieces of the older rock.

Its mineralogical constitution is rather simple, as will seen from the following list of constituents:—

Essential.	*Accessory.*	*Secondary.*
Plagioclase.	Olivine.	Chlorite.
Augite.	Apatite.	Serpentine.
	Ilmenite.	Actinolite.
	Magnetite.	Scolecite.
	Pyrite.	Calcite.
	Mica.	
	Quartz.	
	Oligoclase. (?)	

MICROSCOPICAL CHARACTERS.

Plagioclase-Felspar.—The sections are lath-shaped, short or long laths, sometimes in tabular forms. Of cou it must be remembered that these sections only give u view of one particular plane, and convey to the mi merely inferentially, the image of the solid crystal. T felspars could not be called lath-shaped; lath-sha sections are all that is meant. Out of so many section is surprising to find how few are available for measu ments of the extinction angle. For this purpose only s twins can be selected as give approximately symmetri extinctions on opposite sides of the trace of composit plane. The twin forms are Carlsbad and Albite. have seen none on the pericline type. If we take haphazard sections of felspars in this rock, we shall fi some giving low, some high, angles. The low-angled o are probably those parallel to the base; the high-ang ones parallel to 010, and the maxima of extinctions given by the latter. The highest angle we have noticed 42°, but, as a rule, angles of 30°, 32° are obtained. Fr this the felspar may be inferred to be labradorite and l radorite-anorthite.

* Quarterly Journal Geo. Soc., 1896, p. 375.

Augite.—The augite crystallises after the felspars, sometimes enclosing them, sometimes wrapping them partially round or moulding itself on their ends. This gives rise to the structure called ophitic or diabasic. The structure has been surmised to have originated in rocks which consolidated under hydrostatic pressure, for instance, beneath the ocean; but this is purely hypothetical, and does not account for the same structure in the middle of thick subaerial lava flows. The augite is nearly colourless, or of an extremely light-brown tint; never the violet tinge which characterises the augites of Tasmanian Tertiary basalts. This colour character is occasionally rather useful in distinguishing the mesozoic from the Tertiary dolerites. Where the augites are fragmentary and small and the felspars much reduced in size, and the rock assumes an intersertal structure, as at Killafaddy, Tasman Peninsula and some other localities, doubt sometimes arises, on inspection of microscopical slices, as to whether we are looking at dolerite or basalt. In such cases the absence or rarity of olivine, which at most only occurs sporadically in the Mesozoic rock, is a useful guide. The Tertiary basalts of the island invariably contain a plentiful amount of olivine.

The augite has not been converted into diallage. Twin crystal sections, parallel to the clinopinacoid, exhibit fine oblique striæ, which must be parallel to the basal plane, and not the orthopinacoidal lamination of diallage. In sections parallel to the orthopinacoid the striæ are at right angles to the vertical axis.

Olivine.—This is not an abundant accessory. From most parts of the rock it is entirely absent. When it does occur, as at Killafaddy, Ross, Hobart, Bothwell, West Devonport, &c., it appears to be idiomorphic. It is then one of the early minerals in the rock, most likely second in point of time only to the apatite and iron ores. It appears preferentially in the finer grained varieties and those which show an approach to intersertal structure.

Apatite.—Occurs as slender needles in the felspars and in the unindividualised groundmass when this is present.

Ilmenite and Magnetite.—The iron ores in most diabases are ilmenite and titaniferous magnetite. Ilmenite cannot be recognised in our rock in any definable forms, though many of the shapeless grains may be that mineral. On the other hand the forms of magnetite can be discerned very well. In a section of the interesting rock at the Hobart Railway Station, which is of a porphyritic nature, a very fine magnetite cross is visible. This is an embryonic crystal with two axes at right angles to each other, neatly marked out by octahedral grains of magnetite growing end to end and forming a cross of singular symmetry and beauty. The iron ore is very plentiful in this variety, forming skeletal crystals everywhere. It is, as a rule, abundant in the varieties which possess any interstitial groundmass. In the holocrystalline descriptions it is present in larger grains or crystals, but in very small quantity, and from the ferriferous borders of many of the augites, it is reasonable to suppose that the iron in the rock has been largely utilised in that way.

Quartz.—This is an unexpected mineral in rocks of this class, but we have found it microscopically intergrown with felspar (granophyric intergrowth), in a piece of dolerite from the top of Mount Faulkner, kindly furnished by Mr. R. M. Johnston. Under such circumstances it must be an original constituent.

Mica.—A very little light brown biotite occurs in the Launceston dolerite at the Cataract Gorge, and at the place on the Elphin Road where the rock crops out opposite Mr. Thomas Corbett's grounds. The mineral is not associated with any chloritic products, and appears to be original.

Actinolite.—Needles of this mineral are to be found in the rock at the Railway Station, Hobart, and this is the only locality where we have observed it. It is rather strange that no hornblende is noticeable in any of our specimens, as it is not at all uncommon in the Swedish Hunne diabase, which structurally resembles many of t Tasmanian occurrences.

Chlorite.—This substance is now universally admitt to be only a secondary constituent of diabase, and to be no value in classification. Rosenbusch traces it to t weathering of the augite mineral. Many Tasmani dolerites are perfectly fresh, but others contain a gre chloritic mineral between the felspars, and even in t felspars themselves. In some the augite has been entire replaced by fibrous chlorite, and the rock would be call diabase by many English petrographers. Still this chlo tised dolerite is not a separate geological unit, but forn part of the mass of the fresh rock, and has doubtless receiv its character from the purely local action of ordina meteoric agencies. This fact suggests the old question dolerite versus diabase. Dogmatism is inadmissible her The consensus of petrographical opinion must be allowe to prevail.

Calcite.—This occurs in small quantities, *e.g.*, in t Organ-pipes of Mount Wellington.

Serpentine.—There is a little yellow serpentine in t olivine-dolerites, resulting from the decomposition olivine.

Scolecite.—This zeolite is occasionally found coating t joint planes and faces of the rock at the Cataract quarr Launceston, in white radial aggregates. It is a hydro aluminium and calcium silicate, which has been reporte from cavities and fissures of widely differing rock basalts, dolerite, granite. It is of no particular importan as a rock-forming mineral, but forms interesting specime from the mineralogist's point of view. It is apparently decomposition product originated by the access of meteor waters.

Groundmass.—This occurs sparsely in most varieti between the angles of the felspars, and sometimes forn irregular patches in the rock. In the Hobart Railwa Station rock it is in sufficient quantity to produce porphyritic facies. It mostly forms an imperfectly ind vidualised mass, comprising skeletal and embryon felspars, magnetite grains, &c. Its character is well di played in Mr. Teall's figure of sections of the High Gre plagioclase augite dyke, Q.J., Geol. Soc., 1884, p. XII Fig. 2.

Some of the small felspars in the groundmass of t Hobart rock, and that of Ross, give straight extinctions, a may be oligoclase. The groundmass is holocrystalli felspathic, and has not a basaltic facies. It would appear indicate that the rock did not consolidate subaerially, b on the other hand, not very far below the surface. This f spathic groundmass is plentiful in some of the dolerite ne Bothwell. The main mass of the rock between Bothwe and The Lakes, despite its general coarseness of grain, h a little of it, and it is not wholly absent from the coar ophitic dolerite at the dam on St. Patrick's River. It abundant in a fresh coarse dolerite near Mount Claud which is also remarkable for containing allotriomorph felspar. In some varieties the green chlorite has wandere into the groundmass, as at Mount Direction (south), whe the rock cotains some olivine.

Besides the ophitic structure, we have another modi cation found chiefly in the finer grained varieties of th rock, namely, one in which an incompletely individualis or otherwise indistinct groundmass exists in the interstic of the small crystals of felspar, and round the granules small fragments of augite which are distributed in the interstices. This is the intersertal structure of Rosenbusc Both ophitic and intersertal structures are met with basalts. Intersertal basalts are common all over the worl ophitic ones have been described by Judd, from t Western Isles of Scotland. Gabbros also are sometim ophitic. It would be interesting to know whether the t modifications are characteristic of different geologi occurrences; if so, one would expect to find the ophi structure prevailing in the larger masses of rock, and

rtal in narrow dykes. The most can be said of the ıian occurrences is that the intersertal structure is ɔd to the close-grained varieties.

ɜ of this dolerite become converted into diabase chloritisation of the augite. Thus a diabase on the ʻier (Gould's Country) is a typical occurrence, the of the augite, which is ophitic, being changed into e. Some of the occurrences of diabase in the island ɔssibly be older, but evidence of their age is not yet ɔle. It may yet be shown that some of these altered es are of Palæozoic age; for instance, there is a f diabase near the Hampshire Hills, and near the on the Arthur River, Heazlewood, is a porphyritic ɔ, with ophitic chloritised augite, and a little light biotite. The diabase occurring at the Blue Tier ɔlong to the older series. On the Corinna Road, 8 rom Waratah, is what appears to be a diabase with rtal structure. The felspars in it are smaller than ınd grains of augite occupy the interstices. Both and chlorite are present; possibly this is a mela-

ıe European types with which the Tasmanian ɔic dolerite may be compared, micro-structurally, Hunne-diabase of Sweden, and the Kinne-diabase ıe Kinne-kulle of that country. The latter rock, as lified by one of our slides, exactly corresponds with pical coarse-grained dolerite. In Sweden it covers n rocks in the form of a sheet. The Hunne-diabase Hunneberg, in the same country, and in the same cal position, contains a little bronzite, biotite, quartz, rnblende, but in structure closely resembles some fine-grained varieties.

y people look at our bold escarpments and rugged f "greenstone" and believe that some stupendous ɔn ejected the mass from below and poured it over d in an overwhelming flood. In view of the pre- remarks it is hardly necessary to say that these vere never in the form of a lava over-spreading the the presence of the atmosphere. They have been ably produced by the crystallisation of a magma was injected or intruded into strata lying below the . They have not crystallised rapidly, but under the e of superincumbent rocks, which we seem com- to believe have been carried away by subsequent tion. There is absolutely nothing to show that ʻer succeeded in establishing communication with face. If, however, they did, both the pipes by the magma ascended, and the basaltic flows in which cent finally resulted, have been wasted, without a trace behind. The entire absence of mesozoic in the island suggests that these dolerites always ıbterranean, and that the faces and cliffs which we ɜ are subterranean sections lifted for our inspection or other of the earth movements, which geological so often reports.

ıames by which this eruptive rock is known are ıstant, and the discussion of them introduces us ʻroversial petrology. The rock is that which is diabase in Europe and America, and dolerite by nglish petrographers. It is a plagioclase-pyroxene ʻith the ophitic (and intersertal) structure which so eminently characterises diabase that it has given rise to the term "diabasic structure." The rocks related to it are, on one side, ophitic gabbros; on the other, intersertal basalts. In former days, if the rock was of pretertiary age, it was called "diabase": if more recent, "dolerite." European geologists, however, reserved the term "dolerite" for the coarse interior part of thick lava sheets. This term is not much used now-a-days by Continental petrographers, and the instances in which it is applicable are considered by them as local and unimportant. But the habit of attributing much importance to geological age as a factor in rock nomenclature has now died a natural death, even in Germany, and the only question at issue is that of convenience. Some general agreement is desirable as to whether the present group should be called dolerite or diabase. English petrographers (with the exception of Mr. Harker) use the group name dolerite, and keep diabase for altered varieties of the same rock. This usage was established by the late Mr. Allport, and has been followed by Judd, Teall, Hatch, Rutley. Mr. Harker alone retains "diabase" for massive sills, dykes, laccolites, &c., and applies dolerite to the less important intrusions of similar rocks. Rosenbusch states that diabase, when fresh, is undistinguishable from tholeites and dolerites: Professor Lacroix, in France, upholds the term diabase as the group name. Looking at the present practice of petrographers all over the world, we see that there is a preponderance of agreement in favour of the term "diabase." The future will show whether English petrologists will agree to surrender their somewhat isolated though thoroughly logical use of "dolerite," and fall into line with their colleagues in other countries. All that can be done at present is to observe the trend of petrological opinion, and if one or other of the terms becomes obsolete, it will be necessary to adopt the one which gains general recognition. Meantime we venture to adhere to the English practice, and call this rock dolerite in its fresh condition and diabase in its chloritised state.

The tertiary basalts of Circular Head, Table Cape, Lefroy, &c., often exhibit a coarse intersertal or slightly ophitic structure, and would correspond with what goes under the name of dolerite in Germany. In point of coarseness such basalts are dolerites. They may be distinguished from our mesozoic dolerite by their abundant olivine, glassy base, and greater freshness.

The discovery of a little auriferous wash in the first and second basins of the South Esk at Launceston has led a few people to believe that the mesozoic dolerite might be gold-bearing: but the fact is that the sand which was obtained contained, besides small flakes and water-worn pellets of gold, grains and crystals of quartz, zircon, sapphire, and ilmanite, all minerals of the granite and slate country in the upper reaches of the river, and must be referred to that source. No useful minerals have yet been found in this rock, and the lodes and reefs of our various mines are all of earlier date. The experience of our miners in this respect has been so uniform that search for ore deposits in the dolerite is invariably regarded as useless.

SUPPLEMENTARY NOTE ON LIMURITE IN TASMANIA.

BY W. H. TWELVETREES, F.G.S., AND W. F. PETTERD, C.M.Z.S.

SINCE we contributed a notice* of the remarkable "limurite" rock occurring on the property of the Colebrook Prospecting Association, N.E. Dundas, and more recently discovered to extend in a more or less broken sequence as far north as the Southern bank of the Pieman River, mining operations have been carried on there continuously, and have invested the occurrence with additional interest from that point of view. Renewed examination of the rock under the microscope, as well as in the field, has resulted in further conclusions along the line of our previous enquiries, and these we now submit.

The mine has been made easily accessible from both Ringville and Rosebery, being situate between those townships. The rock occupies the saddle of a hill about 1500 feet above sea level, has approximately a strike of N.E.–S.W., and has been proved to be metalliferous for at least 100 yards in width. The contained metals are magnetic pyrites, arsenical iron pyrites, copper pyrites, and a small amount of bismuth oxide, the copper combined with small gold and silver contents, giving the occurrence its chief economic value. The published assays of the mixed stuff state the copper contents at from 1 °/₀ to 2 °/₀. The Government Analyst is said to have also ascertained the presence of 1 °/₀ of nickel and cobalt in the pyrrhotite examined by him.

Geologically, the rock is a dyke or intrusive mass, apparently developed between slates on the eastern side and serpentine on the west. The intrusion has evidently taken place along or near this line of contact, though it would appear to have come up at the top of the ridge through the slates in several branches or bodies, as horses of hard metamorphic slate have been left standing in it, to the annoyance of the miners. A clean contact is formed, near which the slate, a quartzo-felspathic variety, is micaceous, with chlorite and actinolite. Leaving the metals out of consideration, the dyke is composed of monoclinic pyroxene (largely altered to uralite and actinolite) axinite, calcite, datholite, danburite, with a little secondary quartz (?) chlorite and granular sphene, and a little talc in the rock occurring further north on the Clifton property. We are disposed to consider the presence of original hornblende not established. The axinite is in veins and massive patches, and is intergrown with datholite, danburite, and the other minerals of the rock mass. Professor A. Lacroix, in his memoir on the limurite of the Pyrenees, is of opinion that the rock does not belong to a definite petrographical type, as it is variable in structure, and its mineralogical composition differs in different parts of the same mass. This remark applies with unabated force to the Colebrook intrusion, so far as the dyke as a unit is concerned. Looking at it in this way, it is essentially a pyroxenite, which here and there receives the addition of axinite and other boric minerals. Where these minerals are developed the rock becomes locally limurite, a composite rock containing pyroxene and axinite. It is agreed that the axinite resulted from boric emanations, but how these were introduced is matter for speculation. Was the magmatic reservoir below an independent unit in course of differentiation into basic and acid layers at the time of intrusion? Or was this spot on the confines of two reservoirs, and were the boric vapours, which were carried up in the pyroxenic material, escapes, so to speak, from the neighbouring acid basin? Axinite veins are often found elsewhere injected into rocks already consolidated, but in this case it seems clear that the two elements crystallised synchronously. Even in those parts which are veined by axinite we do not think that the veining was later than the consolidation of the mass as a whole, nor that the rock as a whole had emerged from the phase to which both pyroxene and boron vapours alike belonged. One part of the intrusion may very well have advanced a little further in the crystallising process while other parts lagged behind: and one result of this would be the somewhat heterogeneous character of the dyke as a whole, which, in fact, we observe.

That there was a granite reservoir not far off is shown by the tourmaline-quartz porphyry to the west at the South Renison Bell mine, between which and the Colebrook is another occurrence of axinite, in the form of axinite quartz veins, on the West Coast P.A. sections, close to the granite. A slide prepared from this vein rock shows axinite, quartz, and an abundance of leucoxene. It is noteworthy that the axinite is confined to the vein stuff, as in Cornwall, but there is no occurrence of limurite.

Boron vapours, existing in the magma, and evolved during crystallisation, undoubtedly play a part in producing both tourmaline and axinite. In Cornwall both tourmaline and axinite are found in the granite contact zone, while other rocks, sometimes basic igneous ones, have been acted upon by granite with the same results. In the Hartz axinite and tourmaline occur at the contact of granite and diabase, and this led Lossen to correlate these two minerals.† In view of these facts, it seems to us very likely that the Western granite or its elvans and the Colebrook pyroxinite consolidated contemporaneously. Plutonic solfataric processes, which were plainly in operation in the granite area, as shown by the tourmaline and axinite just referred to, may very well have liberated the boron vapours, which, travelling eastwards by easily imaginable channels, arrived at and were entangled in the moving mass which cooled as the axinitic pyroxenite at the Colebrook. The whole question of this occurrence of axinite possesses a special interest for all occupied with the problems connected with the origin of igneous rocks.

Microscopical inspection of the tourmaline-quartz-porphyry at the South Renison Bell mine discloses a groundmass existing as a Mosaic of quartz and tourmaline, which contains porphyritic crystals of quartz and nests of large tourmaline and quartz crystals. There is no doubt as to the tourmaline. Its colour is brownish yellow and blue, often in one and the same crystal, strongly dichroic O > E, axis of maximum elasticity ‖ c. The tourmaline often enwraps grains of quartz. The quartz contains vacuum bubbles in fluid inclusions in considerable quantity.

Last year a note on datholite as occurring in the Colebrook limurite was submitted by one of us to the society,(‡) and we have since taken occasion to examine this mineral microscopically. In thin section it is colourless, but in polarised light the interference colours are high, comprising the tints of the second and third orders of Newton's scale. The double refraction is slightly under that of augite. In the only direction in which the 001 imperfect cleavage lines

* Proc. Roy. Soc., Tasmania, 1897, pp. 1-6.

† Massige Gesteine. H. Rosenbusch, 1896, p. 103.

‡ Notes on some recently discovered and other minerals occurring in Tasmania. W. F. Petterd, Proc. Roy. Soc. Tasm. 1897, p. 63.

appeared the extinction was straight. No pleochroism is perceptible. The mineral contains microscopical fluid inclusions with moving bubbles, some of which are easily visible with a half-inch objective, other bubbles are stationary.

Another new mineral, which may be added to the list of components of this singular rock, is the boro-calcium silicate danburite, famous for its crystallographic resemblance to topaz. It is disseminated through the stone and abundant on fissure planes in glistening irregular crystal aggregates, looking like quartz; but with a hackly kind of fracture. It is colourless to pale yellow. Under the microscope the relief in Canada balsam is weak, a little less than that of quartz. It gives allotriomorphic interlocking granular sections like grains of a quartzite, and is of startling limpidity. Its interference colour is low, not above the yellow of the first order. Its only inclusions appear to be needles of actinolite.

On one of our slides we notice in the clear substance of the axinite some pale green sub-spheroidal and polygonal translucent crystals generally made up of rods or f somewhat curved, proceeding from the periphery t interior. These remind one of the decomposition ducts of borocite called "parasite" by Volger (* hydrous magnesian borate. The wavy fibres are sugge of some of the forms met with in precipitations fr saturated solution, and the phenomena seem to poi the existence of an excess of boric acid in the rock ma

As the serpentinous and gabbroid rocks at and t west of the Colebrook must be more ancient thar Colebrook dyke, and if our interpretation be correct older than the phrase of activity in the granite bas follows that we have here some light thrown upo question of the age of the granite of the West Coast. do not now formulate a theory of its age, but si observe that the limurite rock will probably be fou constitute one of the factors to be reckoned with in se that question.

* Zirkel, Mik Besch, min und Gesteine, 1873, p. 226.

NEPHELINE AND MELILITE ROCKS FROM SHANNON TIER.

BY W. H. TWELVETREES, F.G.S., AND W. F. PETTERD, C.M.Z.S.

ceived recently from the Mines Department some ens of rocks from the Shannon district, where they en looked upon as indicating the possible occurrence and gold. Mr. George Allison, of Hunterston, kindly mented these, and outlined for us their geological ence on that estate, and from his descriptions we le to indicate broadly the features of the locality. hannon Tier forms there a high plateau of mesozoic te which rises a thousand feet above the Permo-Car- rous country at its base. On the slope below the re small rounded or conical hills of a dark grey, y bluish, basaltic rock; and at the base of or beneath nks of these is a strange-looking coarse zeolitic rock locally "tourmaline-rock." This is as much as can ted at present respecting the geology of this rather e place. The presence of gold is said to have been ished in the tourmaline-rock, but an assay by the nment Analyst did not confirm this.

locality gives us three varieties of eruptive rock, he Mesozoic dolerite, the so-called tourmaline-rock, ie bluish basalt. We may here anticipate by diag- the pseudo-tourmaline rock as nephelinite, and the as melilite-basalt. The geological age of these rocks, as can be hazarded without examination on the spot, bably Permo-Carboniferous for the nepheline and te rocks. The dolerite is considered to belong to the of the Mesozoic era.

rite.—This varies in degrees of coarseness, but is pical ophitic dolerite which occupies the summits of ntral Tiers, and of numerous mountains in every of the island. It is a holocrystalline plagioclase- rock, structurally diabasic, and sometimes, where gite is chloritised, merging into diabase. The well- d prisms of labradorite felspar, sometimes long and r, sometimes stout and short, are cemented together augite mineral; and these two elements have com- to form a non-vitreous massive rock of essentially me mineralogical constitution as gabbro and basalt, regards grain and structure, intermediate between o. If we could follow this rock to its deep-seated in the earth's crust, where the pressure was greater ie process of crystallisation correspondingly slower, ould probably find it existing there as coarsely lline gabbro. On the other hand, we must not l its present surface as in any way its original one. of it, as well as all the overlying rock, has been ed by denudation. Admitting its intrusive nature, are two theories of its occurrence which press their s for acceptance. Seeing that its internal structure closely with that of diabasic sills, has it spread lly from fissures covering up underlying rocks, and g an exposed surface now owing to the removal of erlying strata? On this hypothesis, the dolerite on ers and the mountain tops is only a capping, and sunk through it would pierce the stratified sediments . The level contours of the sidimentary beds ng on the sides or faces of the Tiers, and simulating osition, have suggested this explanation, but we have o demonstration by any actual trial. The enormous ness of the dolerite is greater than that of any sills n to us.

second hypothesis is that what we see represents the ve intra-telluric part of an immense body of eruptive which, as a whole, never reached the surface, but which everywhere thrust out lateral dykes, parts of whic we can still trace in the coal measures. Either explanatio is surrounded with difficulties, which extended observatio alone can solve. This doleritic rock is a product of th gabbroid magma; but we now proceed to notice an entirel different class of rocks, those which have issued from wha Rosenbusch calls a theralitic eruptive magma. Deep-seate rocks give the key to the relationships of the volcani ones. Hence in modern petrology the latter are referre to or compared with their plutonic representatives Theralite is a plutonic nepheline + lime soda felspa (occasionally potash felspar) rock, the deep-seated paren of nepheline and melilite basalts.

Nephelinite.—This is a nepheline-augite rock. A brie examination serves to show that the long black prism which form such a striking feature are not tourmaline bu augite. The interstices between the prisms are occupie by light brown and yellowish nepheline, which has ofte decomposed and originated snow-white radiated aggregate of the Zeolite natrolite. The proportions of augite an nepheline vary greatly. Sometimes the augite is extremel abundant, otherwise more sparingly distributed.

The mineral constitution of the rock may be stated a follows :—

Essential minerals	=	Nepheline, augite.
Accessory minerals	=	Olivine, sanidine, apatite, melanite garnet, magnetite.
Secondary minerals	=	Natrolite, serpentine.

Microscopical characters.—The structure is holocrys talline, hypidiomorphic. No groundmass is present Nepheline, generally, forms about one-half of the entire rock, sometimes more. It gives large sections bounded by rectangular contours, margined with iron oxide, and sometimes penetrated by augite. Its substance is mostly converted into radiating natrolite: some patches, however, remain water-clear. The clear nepheline encloses slende rods of apatite, as well as other needles, which, from thei oblique extinction, we surmise to be augite. The natrolite gives beautiful fan-shaped aggregates, polarising in grey low yellow, and orange colours. The nepheline crystal are often cut up by rectangular cracks.

The augite is in large prisms of green to violet tints sometimes showing both colours in the same crystal. Its maximum extinction angle measured from the fissure lines is 45°. It encloses prisms of apatite. A prominent element of the rock is apatite in long transversely-jointed rods and prisms, some of which are large enough to be visible to the unaided eye. Olivine is an infrequent accessory. It has crystalline contours, the usual rough- looking surface with irregular cracks, and is associated with some serpentinous material. Some orthoclase felspar is also present in small quantity. Its transparency indi- cates the sanidine variety.

No one who has seen the familiar slides of the nephelinite (or nepheline-dolerite as it has been called), of Katzen- buckel in the Odenwald, can fail to recognise the same type in slices of this Hunterston rock. The latter is the same rock reproduced in the Southern Hemisphere. The specific gravity of an average specimen was ascertained to be 2·66.

Melilite-Basalt.—Associated with the nephelinite is the basaltic rock of the small conical hills referred to above This is dark grey compact basalt, with porphyritic olivine and sometimes porphyritic augite. It has a sp. gr. of 3·15

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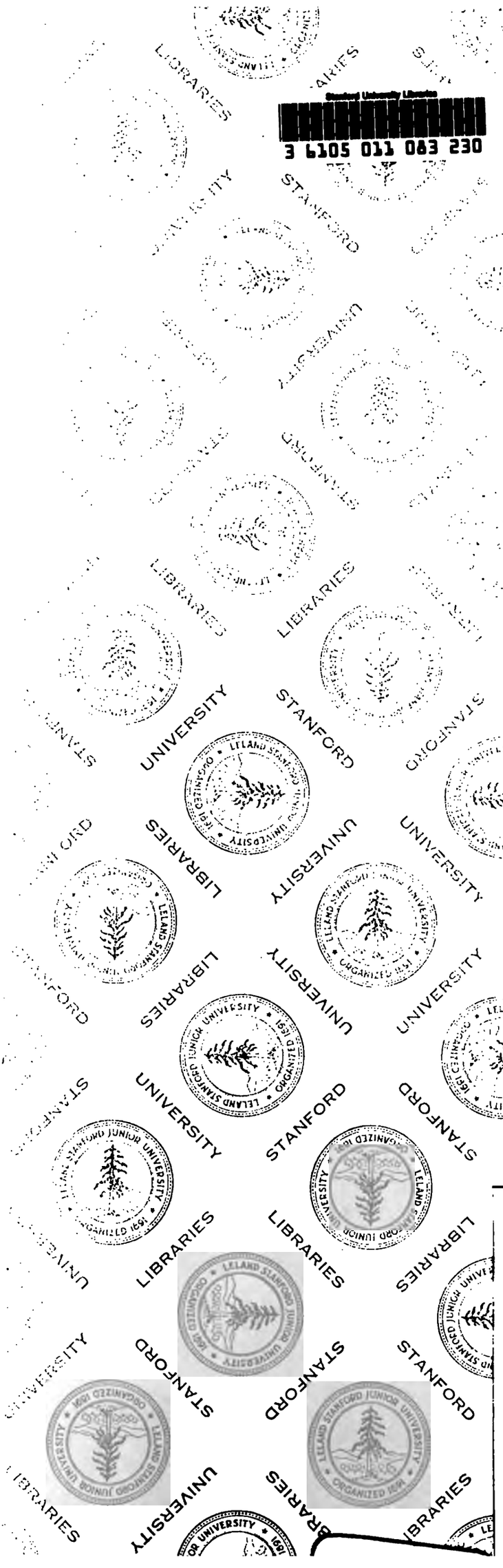
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